



**The Deployment of Balanced Scorecard
Perspectives and Dimensions to Improve
Hospitals' Performance**

Ph.D. Dissertation

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Dedication

“To the soul of the Palestinian patient Salim Al-Nawati, the 16-year-old cancer patient who was left without medical care until he died in 2022... Hopefully, all Palestinian patients will be able to access equitable and high-quality healthcare services in the future.”

“To the Palestinian healthcare workers... many of you told me their voices and opinions are not being heard... Hopefully, it will be...”

“To the Palestinian Ministry of Health and hospitals’ managers... thank you for all the efforts you are doing... Hopefully, this initiative will be part of the endeavors to improve the performance of Palestinian hospitals”

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List of Abbreviations

ACC-EXR	Hospital accessibility experience
AQSS	Availability and quality of supplies and services
AVE	Average variance extracted
BSC	Balanced scorecard
BSC-HCW1	The instrument that engages healthcare workers in a comprehensive assessment of balanced scorecard perspectives and dimensions
BSC-PATIENT	Instrument engages patients in a comprehensive assessment of BSC perspectives and dimensions
BSCP-ATTs	Patient attitudes toward balanced scorecard perspectives
BUILCAP-EXR	Building capacity experience
BUILENV-EXR	Building environment experience
BUIL-EXR	Building experience
CDC	Centers for Disease Control and Prevention
CFA	Confirmatory factor analysis
CFI	Comparative fit index
CITC	Corrected item-total correlation
COMP-PI	Complication perceived image
COVID-19	Coronavirus-19
CR	Composite reliability
CSC	Community scorecard
CVI	Content validity index
CVI-UA	Experts for the content validity index universal agreement
CVR	Content validity ratio
DRGs	Diagnostic related groups
EFA	Exploratory factor analysis
ERRORS	Errors, accidents, and complications
EUP	Efficiency, utilization, and productivity
FINI	Financial incentives
GFI	Goodness-of-fit index
HCAHPS	Hospital consumer assessment of healthcare providers and systems
HCOs	Healthcare organizations
HCW-CENT	Healthcare workers-centeredness
HCW-ENG	Healthcare workers' engagement
HCW-ENGMOT	Healthcare workers' engagement and motivation
HCWs	Healthcare workers
HCW-SCIDEV	Healthcare workers' scientific development
HSRP-PI	Hospital social responsibility perceived image
HW	Health waste
IC	Infection control measures
ICU	Intensive care unit
I-CVI	Item content validity index
IIC	Interitem correlation

INFO-EXR	Information experience
IRB	Institutional review board
ISO standards	International Organization for Standardization
ITRODP	Introductory period
JCI	Joint Commission International
KAP	Knowledge, attitude, and practices
KMO	Kaiser–Meyer–Olkin
KPIs	Key performance indicators
LOS	Length of stay
LOY-ATT	Loyalty attitude
MANAG-COMM	Managerial communication
MANAG-PE	Managerial tasks and performance evaluation
MeSH	Medical subject headings
MTR	Managerial trust
NBR	No blame error reporting
NGOs	Non-governmental organizations
NHS	National health system
NIS	New Israeli Shekel
No. of AVD	Number of admissions, visits, and diseases
NR	Not reported
NRESP	Needs-response
OPT	Operation processing time
PATIENT-ATTs	Patient attitudes
PATIENT-CENT-EXR	Patient-centeredness care experience
PATIENT-ENG	Patient engagement
PATIENT-EXR	Patient experiences
PE	Performance evaluation
PI	Perceived image
PICO	Population, intervention, comparison, and outcome
PMOH	Palestinian Ministry of Health
PQ	Perceived quality
PR-EXR	Price experience
PRISMA	Preferred reporting items for systematic reviews and meta-analyses
PTR	Patient respect toward healthcare workers
QSS	quality of supplies and services
QUALDEV	Quality and development
R	Spearman correlation
RCT	Randomized controlled trial
REPUT	Community and reputation
RESCOMINF	Needs-response, communication, and information provision
RMSEA	Root mean square error of approximation
RoB	Risk of bias

RoB-2	Cochrane risk-of-bias tool for randomized trials-version two tool
ROBINS-I	Risk of bias in non-randomized intervention studies tool
ROBVIS	Risk of bias visualization
S-CVI	Scale content validity index
SERV-EXR	Services experience
SERVQUAL	Service quality scale
SQRT	The square root of the average variance extracted
SRMR	Standardized root mean square residual
STROBE	Strengthening the reporting of observational studies in epidemiology
TECH	Technology
TECH-PI	Technology perceived image
TLI	Tucker–Lewis’s index
TQM	Total quality management
UNRWA	The United Nations Relief and Works Agency for Palestine Refugees in the Near East
WT	Waiting time
WT-EXR	Waiting time experiences
WTLB	Workload time-life balance
χ^2/df	Minimum discrepancy divided by its degrees of freedom

Abstract

Introduction

The balanced scorecard (BSC) is a comprehensive performance evaluation (PE) tool. Stakeholders such as patients and healthcare workers (HCWs) are rarely engaged in BSC implementation at health care organizations (HCOs). The four core studies of this dissertation aim to 1. assess the impact of BSC implementation on HCWs' satisfaction, patient satisfaction, and financial performance, 2. identify all the perspectives, dimensions, and key performance indicators (KPIs) that are important and most frequently used in BSC implementations, and 3- develop two instruments to engage patients and HCWs in BSC (BSC-PATIENT and BSC-HCW1, respectively). Moreover, the dissertation aims to perform four implementations to draw recommendations for health policy makers.

Methods

The search strategies of two systematic reviews were customized for the PubMed, Embase, Cochrane, Google Scholar databases and Google's search engine in adherence with PRISMA guidelines. After removing the duplicates in End Note and accomplishing the screening steps, the measured outcomes were extracted from the final resulting studies. The KPIs were categorized and regrouped using thematic analysis. The risk of bias (ROB) was evaluated. The resulting perspectives and dimensions were used as a guide for the first and second implementations. To develop the BSC-PATIENT and BSC-HCW1, the Delphi technique was used to generate the items and test the content validity, followed by translation and pretesting at one hospital. Then, a convenience sample of 1000 patients and 800 HCWs was recruited at 14 hospitals with the maximum variation technique between January and October 2021. Construct validity was tested through exploratory factor analysis, confirmatory factor analysis, composite reliability, interitem correlation, and corrected item total correlation. The developed tools were used to engage patients, doctors, and nurses in the PE of Palestinian hospitals by assessing their experiences and attitudes. The differences in evaluations based on patient admission status and HCWs' profession were analyzed using the Mann–Whitney U test. Causal relationships were analyzed using multiple linear regression and path analysis to draw BSC strategic maps. Multicollinearities and autocorrelation were tested. For the statistical analysis of the cross-sectional studies, IBM SPSS, IBM Amos, and R softwares were utilized.

Results

A positive impact of the BSC was found on the three measured outcomes in 20 studies but to a lesser extent on HCW satisfaction. The thematic analysis of the extracted 797 KPIs resulted in 45 subdimensions and 13 major dimensions. The ROB was either moderate or high. The best

model of BSC-PATIENT and BSC-HCW1 comprised ten constructs with 36 items and nine factors with 28 items, respectively. The instruments' psychometric characteristics showed adequacy. The first and second implementations revealed gaps in performance and drew recommendations. At the third implementation, 740 questionnaires were retrieved. The mean score for the patient care experience factor was the lowest. The experience factors of information, patient care, services, and building had the highest impact on attitudes. Significant differences based on patient admission were found. At the fourth implementation, 454 questionnaires were retrieved. No differences between physicians' and nurses' evaluations were found. HCWs' workload time-life balance, quality and development initiatives, and managerial performance evaluation have a direct effect on improving HCWs' loyalty attitudes. HCWs' engagement, managerial performance evaluation, and loyalty attitudes have a direct effect on enhancing HCWs' respect toward managers. Quality and development initiatives, HCWs' loyalty attitudes, and workload time-life balance had a direct effect on improving perceived patient respect toward HCWs. Neither multicollinearity nor autocorrelation existed.

Conclusion

This dissertation proves the effectiveness of the BSC and solves the categorization dilemma of BSC dimensions. BSC-PATIENT and BSC-HCW1 are the first self-administered questionnaires specifically developed to engage patients and HCWs in BSC, respectively. The implementation of BSC-PATIENT at Palestinian hospitals provides strong evidence for the impact of patients' information experience on their attitudes. Palestinian health policy makers must prioritize the design and delivery of patient education programs into their action plans and encourage two-way information communication with patients. The implementation of BSC-HCW1 recommends improving low-performing indicators, such as the time spent with patients, HCWs' knowledge of medications and diseases, the quality of hospital equipment and maintenance, and the inclusion of strengths and weaknesses in HCWs' evaluations to enhance HCWs' loyalty and reduce their attempts to leave. For Palestinian hospital managers to be respected more, they must include HCWs in their action plans and explain their evaluation criteria. Patients will respect Palestinian HCWs more if they prioritize their education and work quality, spend more time with patients, and reflect more loyalty. The results can be generalized in Palestine since it encompassed 30% of Palestinian hospitals from all categories.

Keywords: Attitude of health personnel, health services administration, hospital administration, patient-centered care, patient participation, quality of health care.

Chapter 1: Introduction

1.1 Aim of the dissertation

This dissertation consists of four core sub-studies that aim to engage stakeholders in the strategic performance evaluation of Palestinian hospitals based on the balanced scorecard (BSC) tool. The dissertation core sub-studies have the following detailed main objectives:

1. To perform a systematic review to a) gather all studies that have measured the impact of implementing BSC on healthcare workers' (HCWs') satisfaction, patient satisfaction, and financial performance at healthcare organizations (HCOs), particularly since these three measured outcomes represent the latest affected perspectives in the strategic maps [1,2], and b) assess and compare the results among the included studies.
2. To perform a systematic review to a) find and recategorize all the perspectives, dimensions, and key performance indicators (KPIs) that were employed in BSC implementations for unification purposes, b) rank dimensions according to their frequency of use by HCO worldwide, and c) rank dimensions according to their importance from healthcare managers' perspectives.
3. To a) develop an instrument that assesses 1. patient experiences (PATIENT-EXR) in light of BSC perspectives, and 2. patient attitudes (PATIENT-ATTs) in light of BSC perspectives such as perceived image (PI) and attitudes toward BSC perspectives (BSCP-ATTs) including patient satisfaction and loyalty attitudes (LOY-ATTs), and b) customize the developed instrument to Palestinian hospitals, translate it into Arabic, and validate it.
4. To a) develop an instrument that performs a comprehensive assessment of hospitals based on BSC perspectives and dimensions, and b) customize the developed instrument at Palestinian hospitals, translate it into Arabic, and validate it.

Additionally, the dissertation has four sub-studies, which are implementations of the core sub-studies. These implementations have four adjunctive objectives:

- 1- To implement an assessment for cancer care in Palestine based on BSC perspectives
- 2- To implement an assessment of BSC perspectives and dimensions in hospitals during the Coronavirus-19 (COVID-19) pandemic.
- 3- To implement the first developed instrument to perform patient engagement (PATIENT-ENG) in BSC implementation at Palestinian hospitals
- 4- To implement the second developed instrument to perform HCWs' engagement (HCW-ENG) in BSC implementation at Palestinian hospitals.

1.2 Background

1.2.1 Performance evaluation (PE) of the healthcare sector

The healthcare sector's PE is quite challenging and complex. Unsatisfactory performance can result from long patient waiting time experiences (WT-EXR), inefficiency, dissatisfied patients, and HCW burnout [3,4]. COVID-19 imposed further burdens on the healthcare system worldwide due to the limited capacity of hospital beds and the increased psychological stress of HCWs during the COVID-19 pandemic [5,6]. There is still a lack of information that would help healthcare managers and policymakers in the era of COVID-19 to improve the delivery of healthcare quality and to learn for the future [7]. Higher pandemic burdens, such as HCWs' burnout and stress, will rise when HCOs lack plans and preparedness to strengthen their surge capacity and HCWs' resilience [8,9].

Researchers have employed different tools for the PE of HCOs. The most utilized PE tools were the International Organization for Standardization (ISO), Malcolm Baldrige National Excellence Model, European Foundation for Quality Management Excellence Model, Singapore Quality Award, Six Sigma, Data Envelopment Analysis, Pabon Lasso Model, and BSC [10–14]. The World Health Organization initiated the Performance Assessment Tool for Quality Improvement in Hospitals in 2003. It aimed to develop a framework for the assessment of hospital performance. The resulting dimensions from this project were clinical effectiveness, efficiency, HCWs' orientation, responsive governance, safety, and patient-centeredness care experience (PATIENT-CENT-EXR). However, studies have shown that there are still some gaps in this model and issues concerning the dimensions investigated [15,16]. Additionally, the Organization for Economic Co-operation and Development launched the Healthcare Quality Indicator project in 2006; it aimed to develop KPIs to compare quality in healthcare at the international level and achieve international benchmarking. This project concluded that healthcare must be safe, effective, PATIENT-CENT-EXR, timely, efficient, equitable, acceptable, and hospital accessibility experience (ACC-EXR) [17,18].

Most of the abovementioned managerial tools have mainly focused on KPIs related to quality, efficiency, productivity, and timeliness dimensions [10–14,19]. Each of these dimensions is considered a dimension from the internal perspective of the BSC, which consists of four perspectives: the internal process, customer, knowledge and growth perspectives, and financial perspectives [20]. Dimensions are described as collections of homogeneous or related KPIs. They are also referred to as diagnostic-related groups (DRGs) [21], which have been

proven to allow performance comparisons across hospitals and positively impact efficiency improvement [21].

The use of KPIs in the healthcare system before the pandemic has been beneficial for many reasons. First, the satisfaction rates of patients and HCWs increased. Second, they lead to better efficiency, effectiveness, and financial performance and adaptation to new technologies and ideas. Third, they lead to higher productivity and profitability [22–24]. In the pandemic, it is also crucial for HCOs to track the performance of KPIs, which could draw faster attention to areas that require rapid responses and strengthening [8].

1.2.2 History of BSC

The BSC was first suggested by Norton and Kaplan in 1992 [20]. The first generation of the BSC, unveiled by Kaplan and Norton in 1992, involved four perspectives (*Figure 1*): the financial, customer, internal process, and knowledge and growth perspectives, steered by the organizational vision and strategy [20]. The customer perspective focused mainly on the patients. However, in some implementations, it also included HCWs or both [25,26].

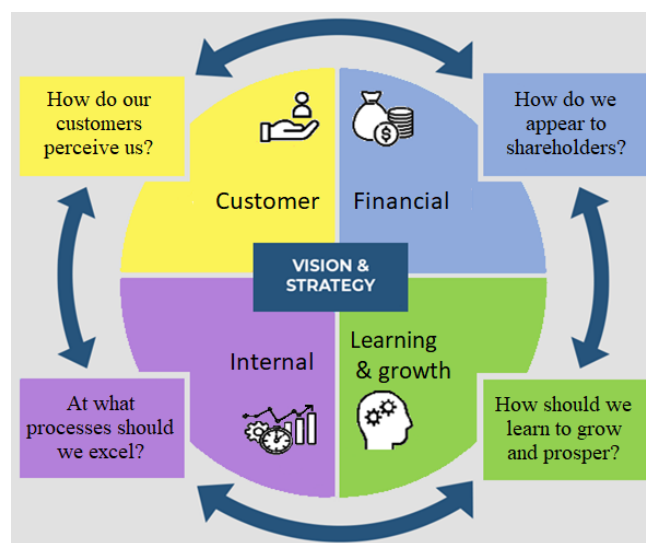


Figure 1. First generation BSC Perspectives.

(Source: [27] with adaptation).

Later, the second generation of BSCs was developed to include strategic maps, in which cause-effect cascades between perspectives or KPIs were inspected [27]. In the third generation of BSCs, a destination statement was incorporated, which evokes where the organization plans to go within a time horizon and the action plans to achieve each targeted objective [28]. In healthcare, Duke Children’s Hospital in the United States of America was the first to implement the BSC in 1997. See the strategic map of Duke University’s health system (*Figure 2*). As a result, the hospital converted 11 million United States Dollars of loss into four million profits

after four years of implementation [29]. Since then, the BSC has gained increasing attention, and many HCOs in high-income countries and low- and middle-income countries have strategically utilized the BSC to develop their organizations [30–34].

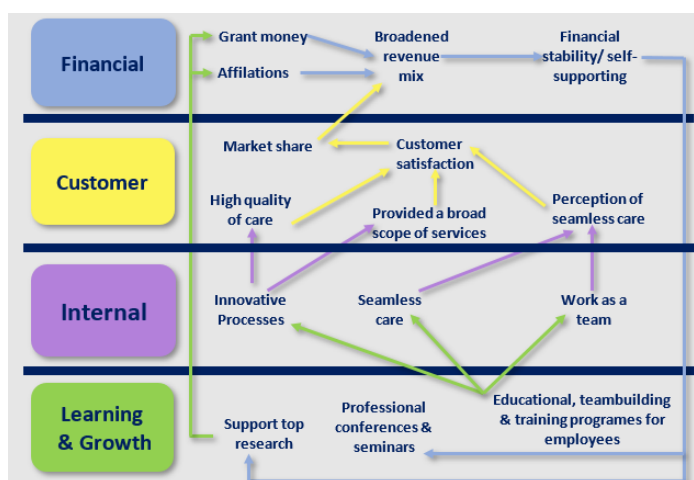


Figure 2. Strategic map of the Duke University health system.

(Source: [35] with adaptation).

BSC perspective assessment provides managers with a comprehensive PE approach [26]. In comparison with other PE tools, most of the available PE models mainly focus on the internal perspective but lack coverage of the other dimensions or perspectives that are also important. BSC was considered different from the other managerial tools for two reasons. First, it offers a holistic approach to PE since it allows managers to highlight both financial and nonfinancial metrics. Second, the BSC is not only a planning or a PE tool. It is also a strategic managerial tool that assigns KPIs compatible with the HCO strategy [23,24]. However, other managerial tasks and performance evaluation (MANAG-PE) tools, such as total quality management (TQM), lack these comprehensive properties [29].

The previous BSC reviews [1,30,34,36–44] focused only on the general narration of the BSC perspectives and sub-dimensions used. Therefore, none of them summarized the perspectives or dimensions of the BSC based on their importance or frequency of use by healthcare managers. Additionally, none of them performed a complete or rigorous scientific methodology to evaluate the effect of BSC adoption in HCOs.

1.2.3 Stakeholders' engagement in healthcare

PATIENT-ENG has been an evolutionary topic in recent years [45,46]. Policymakers realized the necessity of having an evidence-based measure of PATIENT-ENG and capturing its influence [46]. PATIENT-ENG in healthcare is regarded globally as a crucial method for improving patients' adherence, clinical results, and satisfaction with the treatment they receive

[47]. A review of PATIENT-ENG during the COVID-19 era [45] found that there is a need for more original research on this topic during this era. It also found that engaging patients in policy-making decisions requires better attention. However, PATIENT-ENG is a complex and multifaceted experience [45,46]. Additionally, the inclusion of PATIENT-ATTs evaluation while engaging them in the PE process is important for various reasons. First, PATIENT-ATTs are an important outcome measure since they represent the gold standard and a sign for gauging the quality of medical treatment [48–52]. Second, PATIENT-ATTs assist HCO managers in determining which areas of PATIENT-EXR require improvement [48,50–52]. Third, patients' attitudes assist HCWs in knowing what they are doing properly or poorly, which improves patient care services [48,51]. Fourth, patients' satisfaction and trust may be predictive of whether they would adhere to and comply with HCWs' advice and treatment [48,52]. Thus, attitudes may function as mediators between PATIENT-EXR and the intended goal of their improved health status. Fifth, attitudes are associated with whether patients would return for treatment, follow up with their healthcare providers, or alter them [48,51]. This consideration can be important for private hospitals that aim to enhance their profits [49,50]. Last, HCO managers are usually concerned with how to make better resource allocations [50]. All the previous factors reflect why it is important to determine which aspects of patients' experience impact their attitudes and to decide which of them deserves larger investment and attention. When taken into consideration as a whole, each of these factors will ultimately contribute to helping managers improve HCOs' PE.

In parallel, regular participation by HCWs in determining how their work is performed [53], involvement in improvement suggestions [53], goal setting [53], planning [53], performance monitoring [53], leadership engagement [54], quality improvement projects [55], and research are just a few of the numerous types of HCW-ENG [55]. The involvement of physicians and nurses in healthcare is considered an essential strategy since they are mostly known as frontline healthcare personnel [55–57]. The HCW-ENG results in enhancements to HCWs' well-being [55], levels of perceived patient care quality [55], patient outcomes [56], data quality [53], efficiency [53], innovation [53], HCW satisfaction [53,55,58], patient satisfaction [53], performance [53], and decreased levels of unscheduled time off work [55]. However, research indicates that the nursing voice is often overlooked [57]. A review concluded that physicians' engagement techniques include senior leadership support and data-driven quality improvement [54]. Additional HCW-ENG strategies included the allocation of time, resources, training for quality improvement work, financial incentives (FINI), the clarification of organizational goals, and the development of promotion pathways [54].

Furthermore, HCW-ENG during the pandemic was even considered more vital for HCOs [59,60].

1.2.4 Healthcare system in Palestine

The healthcare system in Palestine is described to be incoherent, fragile, and fragmented [61,62]. In addition to the previously described universal challenges in the healthcare sector, the healthcare system in Palestinian territories has been slapped by political and economic conflicts. The 87 hospitals in Palestinian territories have five major types based on administrative type: 28 public, 39 non-governmental organizations (NGOs), 17 private, two military, and one United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA) [63]. Military hospitals are not yet operating on the West Bank. The bed percentage per administrative type is approximately 59% public, 26% NGO, 14% private, and 1% UNRWA [64]. These hospitals are distributed as follows: seven in eastern Jerusalem, 53 in West Bank, and 30 in Gaza [65]. The geographic separation with the disrupted mobility between these territories, added to the blockade of the Gaza strip, the checkpoints in West Bank and Jerusalem, the separate de facto government health systems in Gaza and West Bank, the heavy reliance on external health financing, and the dependence on direct household expenditures imposed further challenges on improving the Palestinian healthcare system [61,66–68]. The geographical separation of the Palestinian territories and the distribution of hospitals in the West Bank and Jerusalem based on the city and administrative type are explained in *Appendix A1*. The spread of coronavirus-19 (COVID-19) has added an additional challenge. A recent study [69] referred to the COVID-19 era in conjunction with political conflict as having a double epidemic effect on Palestinian territories, which eventually impacted the Palestinian health system and HCOs' performance during the pandemic.

1.3 Literature gap

Despite the previously explained importance of PATIENT-ENG and HCW-ENG in the literature, recent reviews [30] revealed that there was a lack of engaging stakeholders in BSC implementations. In addition to this literature gap. To our knowledge, no research has utilized the BSC tool to evaluate the performance of Palestinian hospitals to date. Moreover, there is a lack of PATIENT-ENG and HCW-ENG in the PE implementation of Palestinian hospitals in general. Consequently, this dissertation implication will make comprehensive PEs of Palestinian hospitals based on the HCWs' and patients' points of view. This will lead to recommendations for Palestinian hospital managers as well as health policymakers on how to improve the PEs of Palestinian hospitals in their future action plans.

Chapter 2: The impact of implementing BSC

(Sub-study 1): The Deployment of BSC in HCOs: Is it Beneficial? A Systematic Review¹

2.1 Introduction

Until the beginning of 2022, two reviews focused on studying the effect of BSC on health, one of which analyzed the impact qualitatively [38], and the other presented a few instances of the positive influence [1]. This showed that no complete or rigorous scientific methodology has been reported until then to evaluate the effect of BSC adoption in HCO. Given the lack of research on this topic, we performed a systematic review in which we assessed the impact of implementing the BSC on three attributes that represent the latest affected perspectives in the strategic maps [1,2]: HCWs' satisfaction, patient satisfaction, and financial performance. Thus, the present systematic review aims to gather all studies which have measured the impact of implementing BSC on HCWs' satisfaction, patient satisfaction, and financial performance at HCO; particularly, since these three attributes represent the latest affected perspectives in the strategic maps [1,2]. Further, this review aims to assess and compare results among the included studies.

2.2 Methods

Our previous systematic review analyzed the dimensions and indicators of BSC utilized at the PE. of HCO [26]. This systematic review was carried out by finding all studies that approached BSC implementation's impact in HCOs in adherence with the 27-point of the preferred reporting items for systematic reviews and meta-analyses (PRISMA) checklist [70].

2.2.1 Eligibility criteria

The inclusion and exclusion criteria were set as shown in *Table 1* below.

¹ This chapter is based on the following paper: **Amer F**, Hammoud S, Khatatbeh, H, Lohner, S, Boncz I, Endrei D (2022). The deployment of balanced scorecard in health care organizations: is it beneficial? A systematic review. BMC Health Services Research, 22(1), 1–14. <https://doi.org/10.1186/s12913-021-07452-7>. **Impact factor: 2.908**

Table 1. Inclusion/exclusion criteria and search strategy for PubMed

PICO	Inclusion criteria	Exclusion criteria	Search Strategy (MeSH terms and keywords) for PubMed
Population	Any type of HCO	Non- health organization	hospitals[MeSH Terms] hospital department[MeSH Terms] health[MeSH Terms]
Intervention	Performance assessment of HCOs through implementing BSC	Studies that used other TQM tools such as Malcolm Baldrige National Excellence Model, ISO, Singapore Quality Award, six-sigma, etc.	"quality indicators, health care"[MeSH Terms] scorecard*[Text Word] "score card*"[Text Word]
Comparator	-Initiation of BSC implementation (at least one year of implementation) -Or: Comparing two measurements after BSC implementation for at least one year -Or: Gross change/ difference after at least one year of implementation	- Initiation of BSC implementation was in less than one year. -Gross change/ difference after less than one year -One-time measurement with no comparability.	No limitation was set in the search strategy, studies that measured BSC impact within less than one year of implementation were excluded after carefully examining the full texts.
Outcome	-Impact on financial indicators: profitability/loss, change in total revenues, change in total cost, Return on investment, return on assets, either in currency or in percentage. -Or: Impact on the patient satisfaction rate -Or: Impact on the HCWs' satisfaction rate -The impact should be objective and measured/ quantitative.	-Impact on other indicators. -Number of patient complaints -HCWs' burnout or turnover rate. -Cost/case or revenue/case change -Qualitative or subjective impact, for example, the managers' opinions in impact	patient satisfaction[MeSH Terms] cost-benefit analysis[MeSH Terms] health care costs[MeSH Terms] Hospital personnel management[MeSH Terms] staff development[MeSH Terms] knowledge management[MeSH Terms] efficiency, organizational[MeSH Terms]
Study design	All study designs	-	No limitation regarding study design, type, or time was set in the search strategy

Note: HCOs, healthcare organizations; BSC, balanced scorecard; TQM, total quality management; ISO, International Organization for Standardization; MeSH, medical subject headings.

2.2.2 Data sources, search strategy, and study selection

In the present systematic review, the search strategy was developed by two authors who are experts in healthcare management and BSC, and an expert in systematic reviews and meta-analysis. The search strategy was initially developed for the PubMed database based on the population, intervention, comparison, and outcome (PICO) tool [71], and depending on using both medical subject headings (MeSH) terms and keywords (*Table 1*). Next, the strategy was adapted to Cochrane Central Register of Controlled Trials, Embase, and Google Scholar databases, as per Cochrane's recommendations [72]. See the strategies developed for these databases in *Appendix A2*.

The grey literature, pre-prints, and unpublished studies were searched on Google Scholar and Google's search engine websites to reduce publication bias. Furthermore, we attempted to identify other potentially eligible studies or ancillary publications by searching the reference lists of any potentially eligible studies. The databases were searched until October 2020. Afterward, we conducted the search strategies on the electronic databases and removed the duplicates using the EndNote X9.2 program.

Two authors independently performed the selection of eligible studies. A discussion after each step was made or, if necessary, a third author was consulted for arbitration in case of disagreements. Initially, the titles and abstracts of the studies were examined to eliminate irrelevant studies. In the second step, the full texts of all potentially relevant studies were carefully reviewed to make a final decision based on the criteria mentioned above. Authors of studies with no available full texts or unclear impact duration were contacted to obtain further details and clarification.

2.2.3 Data extraction process

Data extraction was performed between June and July 2021 and then compared to discuss differences. The following data were extracted from the eligible studies: 1) author/s, 2) year of publication, 3) country of origin, 4) data collection duration, 5) data collection tool, 6) the number of perspectives, 7) the number of KPIs, 8) availability of weights/importance for perspectives or KPIs, and 9) outcome, which is represented in the KPIs that have been used and their weights/importance. The frequency of each KPI used at each implementation was plotted on Microsoft Excel, and the sum was calculated. In addition, the weight/importance assigned for each KPI at each implementation was reported on a scale of 100%. In the case of

studies that did not give weights/importance explicitly, each KPI weight/importance was calculated by dividing one by the number of KPIs used in that study to assign an equal weight/importance for each KPI. Consequently, we computed an average of the weights/importance assigned for each KPI. Next, we performed regrouping and coding for the KPIs to find the frequency of use and the set weights/importance percentages for each dimension. Then, the resulting major and sub-dimensions were listed and described between August and September 2021.

The research design of eligible studies was extracted directly from the studies. However, if the research design was not explicitly mentioned, we determined it based on the role of the investigator in that study. Specifically, the study was considered observational if the BSC exposures were naturally determined and the investigator had no part. On the other hand, the study was considered experimental if the investigator actively assigned the BSC intervention.

2.2.4 Quality assessment

The risk of bias (RoB) assessment was performed by two authors independently between March and June 2021 to assess the quality of the included studies. As per the Cochrane collaboration's guidelines, the Cochrane risk-of-bias tool for randomized trials-version two (RoB-2) was used for the assessment of randomized controlled trials (RCTs) [73]. The risk of bias in the non-randomized intervention studies tool (ROBINS-I) was used to assess the observational and quasi-experimental studies [74]. As per the Cochrane Handbook, authors should avoid summarizing the overall RoB [75,76]. Therefore, the RoB was analyzed at the study level and across studies. In the RoB-2 tool, five types of bias were assessed: bias arising from the randomization processes, bias due to deviations from intended interventions, bias due to missing outcome data, bias in the measurement of outcomes, and bias in the selection of the reported results. On the other hand, in the ROBINS-I tool, seven types of bias were assessed: bias due to confounding, bias in the selection of participants in a study, bias in measurement/classification of interventions/ exposures, bias due to deviations from intended interventions/ exposures, bias due to missing data, bias in the measurement of the outcomes, bias in the selection of the reported results.

While using the RoB-2 tool, each type of bias was assessed as low, high, or unclear. While using the ROBINS-I tool, each type of bias was evaluated into five categories: low, moderate, serious, critical, or no information. Afterward, the assessment results of the two

reviewers were compared. Where there was disagreement, other authors were consulted. Figures for RoB were prepared using the risk of bias visualization (ROBVIS) tool [77]. Lastly, it was recommended not to advocate quality appraisal as a criterion for inclusion in reviews [78]. Therefore, the authors decided to include all studies in this systematic review regardless of their quality assessment.

2.3 Results

2.3.1 Study selection

Initially, the search strategy resulted in a total of 4031 studies. After removing the duplicates, a total of 2985 studies remained, which were screened based on their titles and abstracts. Then, irrelevant studies were excluded; thus, 202 studies remained. A careful examination of the included studies' full texts was made; based on this, only 20 studies were finally included in the current systematic review. Details of the study selection process are shown in the PRISMA flow-chart (*Figure 3*). The main characteristics of the included studies are shown in *Appendix A3*. Regarding the implementation location, nine studies were implemented in North America, two in Europe, one in Africa, seven in Asia, and one did not specify the location. It should be noted that 14 studies were performed in high-income countries, two in upper-middle-income countries, one in a lower-middle country, and only two in low-income countries. Out of the 20 selected studies, 16 were performed in hospitals or hospital departments, and four in healthcare facilities or clinics (*Appendix A3*). Even though no limitation was imposed on language, all of the selected 20 studies measuring the impact of BSC implementation were written in English.

Out of the 20 selected studies, only three studies reported their study designs explicitly. However, our classification showed that 11 studies were observational since the investigators were not involved in implementing BSC; instead, these investigators only observed the results of already implemented BSCs at HCO. On the other hand, the remaining nine studies were experimental. One out of the nine was RCT, while the other eight were quasi-experimental studies, which included three pretest-posttest components and five Interrupted Time Series (*Appendix A3*). Notably, only three studies [79–81] randomly selected HCO, participants, or both.

Variances among the data collection instruments used in the 20 studies are shown in *Appendix A3*. Notably, the employed instruments were validated only in six studies [80,82–86]. Additionally, only five studies [83–87] assessed the instruments' feasibility. The pre-

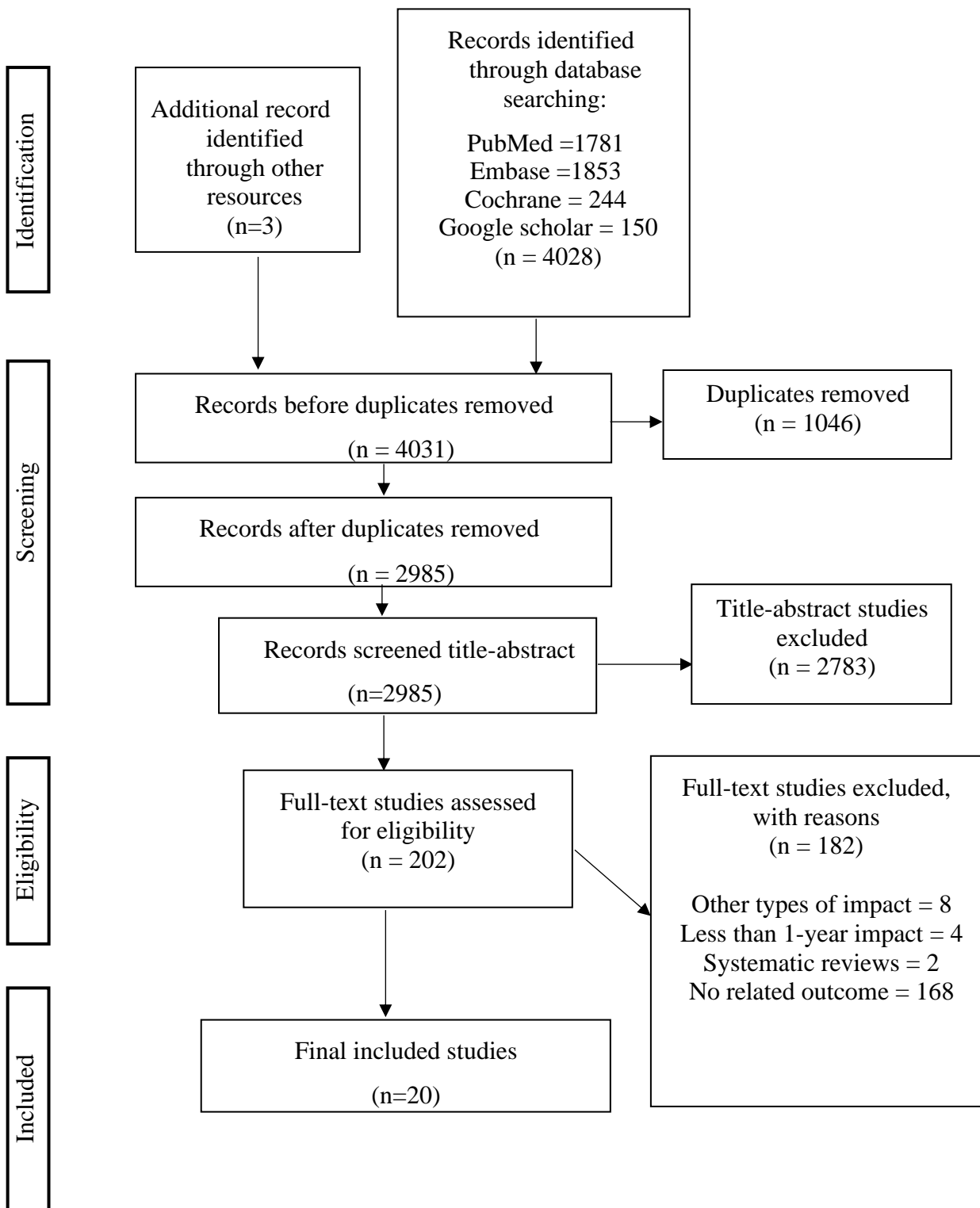


Figure 3. PRISMA flow diagram.

(Source: Own elaboration).

testing of the instruments was carried out only in three studies [80,82,84]. In addition, only five studies [83,84,87–89] assigned weights for the indicators or assessed their importance before implementation. Further, only one study [90] evaluated the indicators depending on more than one source for the same variable.

The 20 studies chosen for this systematic review utilized different BSC generations. The first generation of BSC was employed in seven studies [83,85,86,89–92] which discussed explanations, the definition of perspectives and indicators, and how to measure each indicator. Besides these seven studies, one other study [93] used the first-generation BSC; however, only customer and patient satisfaction were explained in the way they were measured. Further, only five of the 20 studies [84,85,90–92] specified the source for each perspective/indicator, while one study [83] mentioned them partially. The aspects of BSC's second-generation were found in five of the 20 studies [85,89,90,93,94], where users modified the objectives of each indicator during implementation to suit strategy, vision, mission, and goals. Additionally, two other studies [83,87] modified these objectives partially but failed to explain them sufficiently. Further, strategic maps were only illustrated in six studies [85,88,89,91,94,95]. Finally, it is worth noting that only three studies [85,89,90] displayed the cause-effect cascade between indicators and targets.

Regarding the third generation's aspects, seven of the 20 studies [85,89–94] approached destination statements or targets within a time horizon. Besides, one study [29] approached the length of stay indicator only. Additionally, only one study [94] approached strategic initiatives or action plans to achieve the targeted performance.

The included studies assessed different outcomes for implementing BSC. Out of the final 20 eligible studies, 17 studies [29,79,89–91,93,94,96,80–85,87,88] measured the impact of BSC on patient satisfaction, seven measured HCWs' satisfaction [79,81,84,85,90,92,97], and 12 studies measured financial performance [29,84,97,98,85,87,90–93,95,96]. However, the measured variables varied among studies, even in terms of the same dependent variable (*Figure 4-Figure 7*). For example, BSC's impact on patient satisfaction varied from overall satisfaction to the satisfaction of specific categories, such as adults, children, inpatients, outpatients, patients in the emergency room, and patients in rehabilitation. In addition, the measured variables varied based on the service type, such as satisfaction with home care services and departmental services.

Regarding HCWs' satisfaction, the name assigned to the targeted population varied from staff and employees to HCWs. Further, the HCWs' satisfaction type varied, for instance,

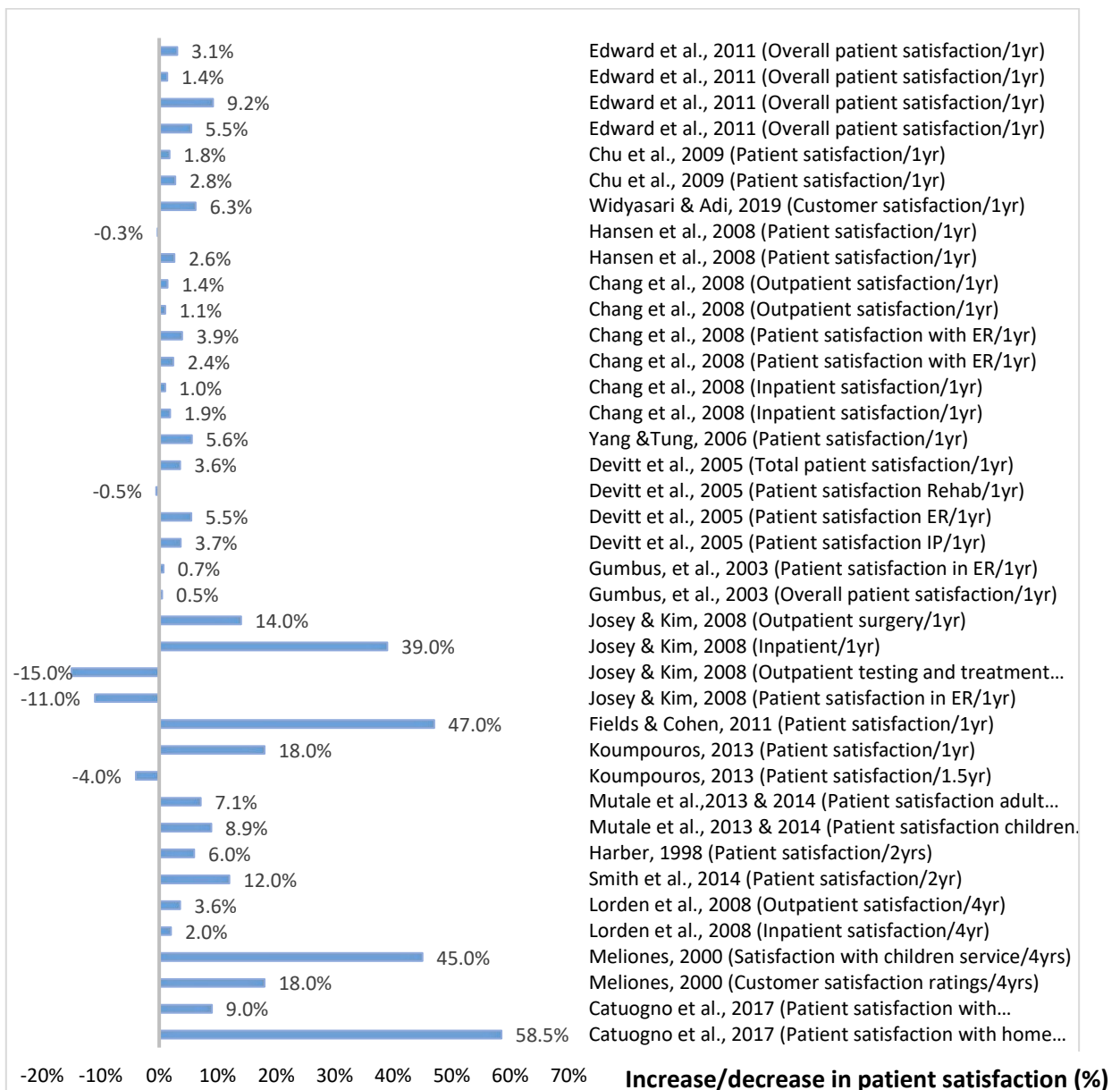


Figure 4. Patient satisfaction impact.
Increase or decrease in patient satisfaction rate after BSC implementation (%). (Source: Own elaboration).

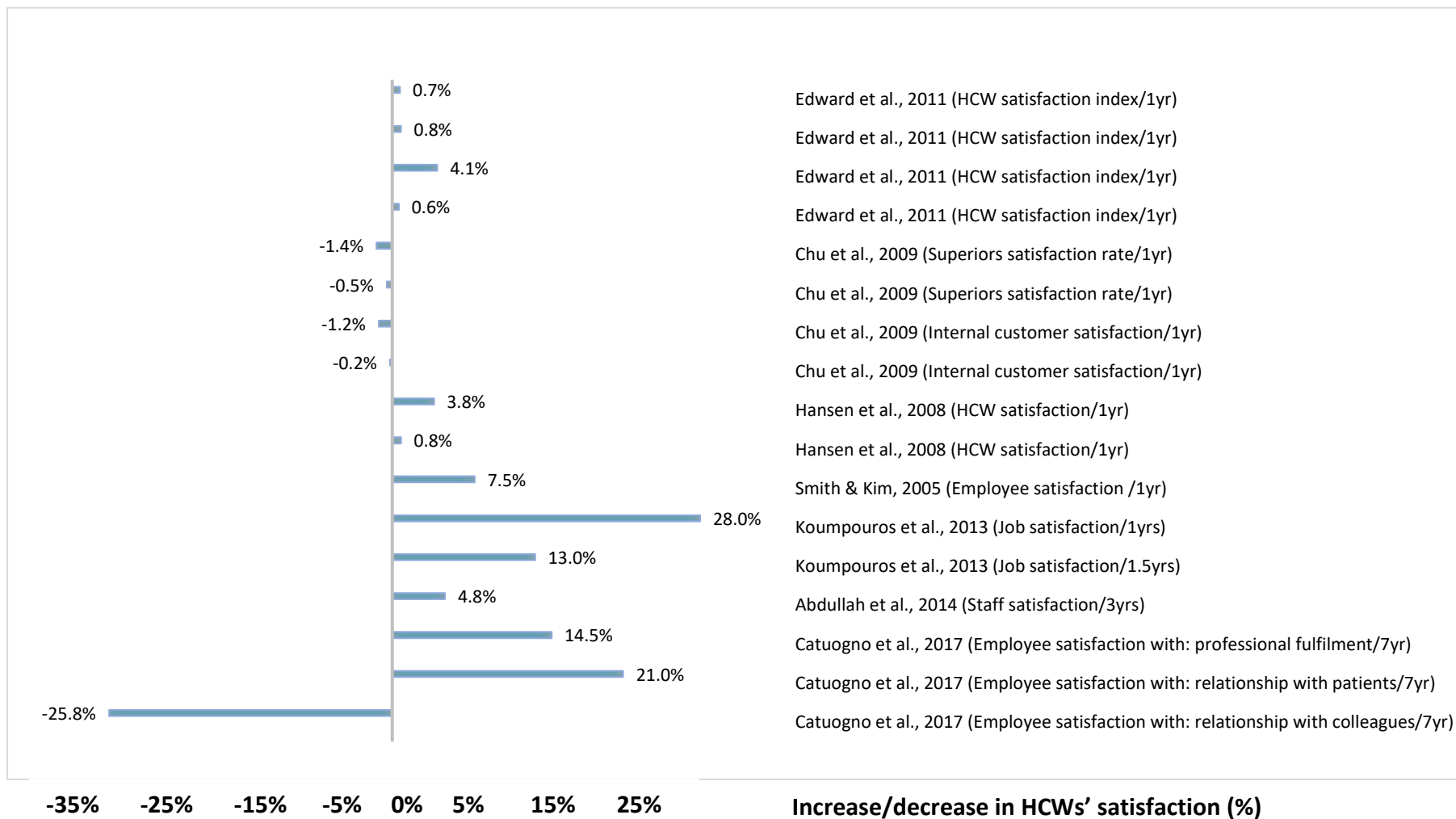


Figure 5. HCWs' satisfaction impact.

Increase or decrease in HCWs' satisfaction rate after BSC implementation (%). (Source: Own elaboration). Note: HCWs, healthcare workers.

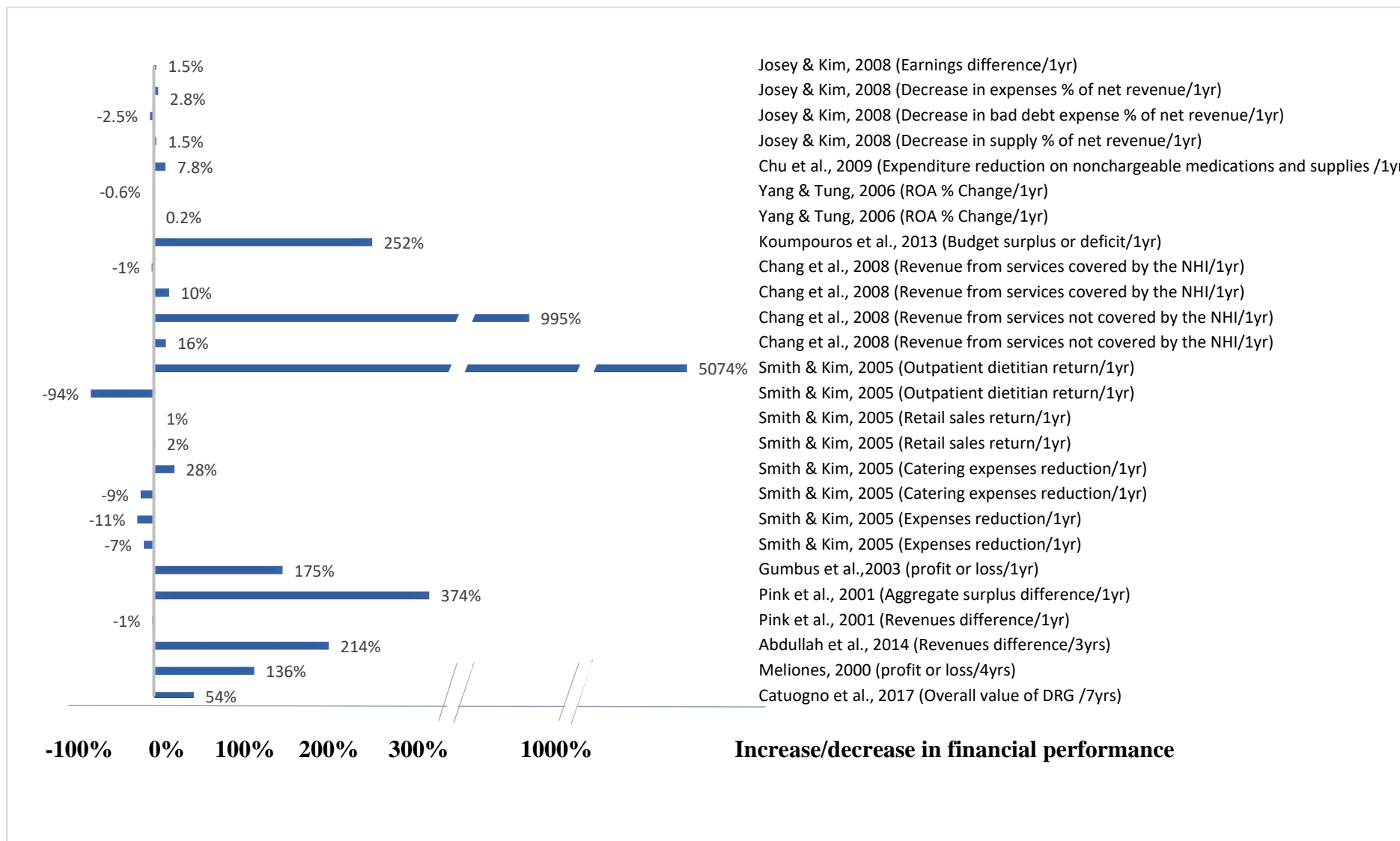


Figure 6. Financial impact (%).
 Increase or decrease in financial performance after BSC implementation (%). (Source: Own elaboration).

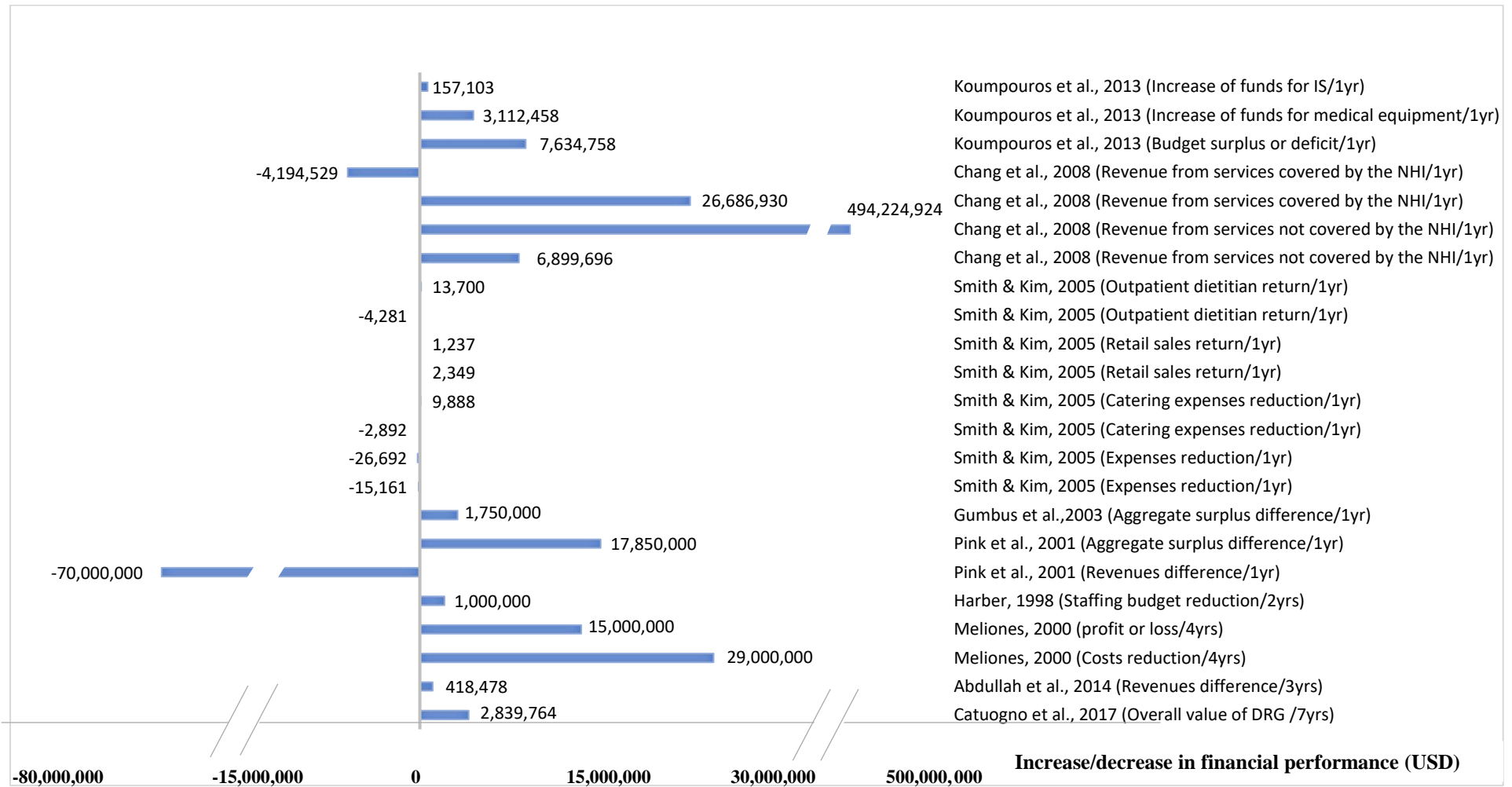


Figure 7. Financial impact (USD).

Increase or decrease in financial performance after BSC implementation in USD. (Source: Own elaboration). NOTE: USD: United States Dollar.

from HCWs' satisfaction with their job to HCWs' satisfaction toward their superiors. However, the financial variable had the greatest variation among all three primary outcomes measured. Specifically, it was found that there exists a reduction in costs, expenditures, HCWs' budget, expenses, catering expenses, expenses/net revenues, bad debt expenses per net revenue, and supply per net revenue. On the other hand, an increase in revenue types included; returns, profits, aggregate surplus, funds, the value of drug-related groups, and return on assets.

Moreover, the unit used for financial impact assessment differed among studies. For example, all studies used currencies for assessment, where these currencies also varied between studies, except for a few studies [84,91,93] which used a percentage method. As an attempt to reduce bias, all currencies were converted to United States Dollars to standardize and make the comparison across studies more consistent regarding the financial outcomes in the systematic review. Further, the authors of one study [85] were contacted for clarification since they did not report the currency. As a result, *Figure 6* and *Figure 7* were designed as seen above; one for the impact in currencies and the other for the impact in percentages.

Most studies used a percentage score to measure the impact on patient and HCWs' satisfaction, except for three studies [85,92,97], which performed the measurement based on a four or five point-Likert scales. However, to make the comparison consistent, all Likert scales were converted to percentages (scores out of 100%).

2.3.2 Quality assessment

As illustrated in *Appendix A4*, each study was evaluated in terms of RoB. For that purpose, the RoB-2 tool was employed to assess the sole RCT study [80], in which the assessment was deemed fair, except for the performance bias. On the other hand, the RoB in the quasi-experimental and observational studies was measured using the ROBINS-I tool; and it was found that there was no information about analysis methods of confounders' adjustments except in four studies [26, 30, 33, 38]. The confounding agents were apparent in three studies [28, 29, 31]. However, the three studies failed to adjust for the confounders, which may have affected the precision of the measurement. Furthermore, the selection bias across studies reflected serious RoB in five studies [84,89,91,92,95]. A possible reason the intervention and the follow-up did not coincide together and a potentially substantial amount of follow-up time was missing in the analyses. The moderate RoB showed that the intervention status was well-defined, but some aspects of the assignments of intervention status were determined retrospectively. Further, outcome measurement bias was raised either due to the non-blinding

of intervention among assessors [81] or because the outcome measure was subjective and likely to be influenced by other factors [88,90] (*Appendix A5*).

2.4 Discussion

2.4.1 Discussion of the main results

This systematic review aimed to identify all the studies which measured the impact of BSC implementation on three variables: HCWs' satisfaction, patient satisfaction, and financial performance at HCO, and then proceeded to analyze the effect of these BSC implementations. The analysis of the results reflected a remarkably positive impact of BSC on patient satisfaction in most studies. The same positive impact of BSC implementation holds for financial performance in both currency and percentage indicators. Notably, the authors found that almost all studies showed a positive impact, amounting to several million United States Dollars. However, a few studies reflected a moderately negative impact on financial performance, which form three distinct categories. The first category includes study [90], which explained the occurrence of unintended events that may have negatively affected financial performance. The second category comprises studies [92,95] that revealed a highly positive impact on financial performance in previous or subsequent years, which may reflect a sloth in the following up. The third category includes studies [85,86] that showed a positive impact on financial performance on one or more of the other impact types. The analysis of BSC's impact on HCWs' satisfaction revealed a less remarkably positive impact (*Figure 4-Figure 7*).

2.4.2 Agreements and disagreements with other studies or reviews

The findings obtained from the present systematic review are in line with a systematic review [99] that reviewed BSC's benefits in business, management, and accounting fields. Furthermore, the present study is the first to summarize all BSC implementations and their impacts on the healthcare sector based on quantitative comparisons. Moreover, the current study was compared with other reviews in the healthcare sector. For instance, a review [30] carried out a mere description regarding the application of BSC. In contrast, a review [26] only summarized the perspectives and dimensions utilized. Lastly, a review [38] only mentioned examples of BSC impact. One probable explanation for the mild impact on HCWs' satisfaction can be referred to the lack of managerial engagement with the non-managerial HCWs upon BSC implementation, the lack of understanding by HCWs about the advantages of BSC implementation s, or the fear of potential responsibility and accountability placed upon HCWs

due to BSC implementation. As a result, HCWs may have declined to implement BSC, contributing to a lower satisfaction score. In conclusion, future researchers should consider increasing employee participation in BSC implementations.

For instance, in a study [90], the employees did not have incentives or motives to participate in BSC since they were permanent employees. Further, the study showed that HCWs above 40 years old negatively influenced creativity and productivity upon BSC implementation. Other researchers in [49] also referred to this challenge and noted that major deficiencies arose from qualified personnel and HCWs aging. However, those researchers have also suggested that the high-ranking qualifications of HCWs, driving learning and a growth perspective, will eventually generate motivation for new HCWs to resolve this issue. Other proposed ideas to solve this problem were creating an open environment for learning and growth and encouraging active managerial communication (MANAG-COMM) with HCWs to ensure the successful implementation of BSC. Other researchers [100] encouraged senior management commitments to involve non-managerial HCW, promoting clear articulation of benefits and relevancy of BSC to clinicians. This challenge mirrors the findings of another review [51], which realized that the attitude perceived by healthcare professionals toward accreditation was negative and skeptical because of quality concerns regarding services and their costs. Therefore, the authors in the latter study suggested that healthcare professionals, especially physicians, require more intensive education about the potential benefits of accreditation.

Finally, the quality assessment revealed that many studies had high RoB, which may have affected the impact results. A recommendation for the researchers and managers implementing BSC in the future is to dedicate more focus to raising the quality of implementation and lowering the RoB. Moreover, a better focus on the second and third generations of BSC aspects is essential.

2.4.3 Strengths and weaknesses

The current systematic review contains several strengths. To our knowledge, this is the first paper that has analyzed all the studies which measured the impact of BSC on patient satisfaction, HCWs' satisfaction, and financial performance in HCO. The results and analysis of this systematic review support the positive impact of applying BSC in HCO, especially on patient satisfaction and financial performance. Further, a greater emphasis on the role of HCWs is required when implementing BSC since HCWs' satisfaction showed slightly positive, almost zero, or somewhat negative scores in most studies included. Additionally, the three primary

outcome measures concentrated upon in this systematic review are considered the last destination for impact in the strategic maps and the causal effects in most BSC studies. Finally, unlike other BSC reviews [1,38], which included definitions of biobanks, pharmacies, laboratories, radiology, and medical colleges in HCO, this review limited the definition to the primary, secondary, or tertiary HCOs. This strategy leads to the homogeneity of the resulting studies and leads to more valid comparisons among the results.

Nevertheless, this paper has some limitations. First, it focused on the impact of BSC on the three chosen indicators only, whereas impacts on other types of indicators were not considered for analysis. Due to the vast variations of indicator types, analysis of these indicators presents a challenge, requiring narrowly specified modes of analysis. Secondly, no meta-analysis could be applied to this systematic review resulting from the heterogeneity of studies regarding their data collection tools and the enormous variation in the types of indicators. However, the later variation was clarified in the charts, and the data collection tool was specified for each study. Thirdly, the current review included studies that measured the impact after at least one year of implementation. Fourthly, it is essential to mention that the impact comparability is roughly more rational for patient satisfaction and HCWs' satisfaction than financial performance. This could be referred to as the comparison ability based on a percentage score of 100 for the satisfaction variables. Additionally, the change in financial performance based on currency could be influenced by other confounding factors such as the HCO size or the number of health facilities included in the study. Therefore, future studies should consider these confounding factors. Moreover, future studies should reduce the RoB due to the lack of high-quality BSC implementations in the literature. Finally, this review searched for the BSC implementation in healthcare databases; consequently, future systematic reviews are recommended to include studies in management and health policy databases.

2.5 Conclusion

In conclusion, this systematic review offers evidence to HCO and policymakers on the benefits of implementing BSC in HCO. Although the quality assessment revealed that many studies had a high RoB, BSC implementation positively influenced HCO patient satisfaction and financial performance. Based on the findings in the present review, researchers are encouraged to focus on lowering the RoB in BSC implementation in the future. HCO managers are also advised to consider HCWs' satisfaction and HCW-ENG in future BSC implementations. Finally, an additional assessment of the BSC impact on HCO during the COVID-19 pandemic is required, as we could not find any.

Chapter 3: BSC perspectives and dimensions

(Sub-study 2): A systematic review: the dimensions to evaluate healthcare performance and an implication during the pandemic²

3.1 Introduction

Our first systematic review [25] proved that BSC implementations were effective in improving the financial performance of HCOs, elevating patient satisfaction rates, and to a lesser extent improving HCWs' satisfaction rates. BSC reviews [1,30,34,36–44] focused only on the general narration of the BSC perspectives and sub-dimensions used. Moreover, none of them summarized the perspectives or dimensions of the BSC based on their importance or frequency of use by healthcare managers. In other words, all the previous systematic reviews lack a systematic methodological categorization of perspectives, dimensions, and KPIs.

In correspondence with this research gap, this review aims at a) finding and recategorizing all the perspectives, dimensions, and KPIs that were employed in BSC implementations for unification purposes, b) ranking dimensions according to their frequency of use by HCOs worldwide, and c) ranking dimensions according to their importance from the healthcare managers' perspective.

3.2 Methods

This systematic review is part of a broad project. After assessing the impact of the BSC on stakeholder satisfaction [25] and before developing instruments to engage stakeholders in BSC implementations, we sought to accomplish the previously mentioned aims to summarize which dimensions were the most frequently used and essential as per healthcare managers in implementing the BSC. This review was conducted according to the 27-point checklist of the PRISMA checklist [70].

3.2.1. Eligibility criteria

² This chapter is based on the following paper: **Amer F**, Hammoud S, Khatatbeh H, Lohner S, Boncz I, Endrei D (2022). A systematic review: the dimensions to evaluate health care performance and an implication during the pandemic. BMC Health Services Research 22, 621. <https://doi.org/10.1186/s12913-022-07863-0>. **Impact factor:2.908**

The inclusion and exclusion criteria were set based on the PICO tool [71] and were the same as those used in the first systematic review. Additionally, all study designs were included (*Table 1*).

3.2.2. Data sources, search strategy, and study selection

The same search strategy used in the first systematic review [25] was also used for the second systematic review with a different aim (*Appendix A2*). For that, the selection of eligible studies was performed independently by two authors in all steps. Disagreements were resolved by discussion after each step or, if necessary, through arbitration. First, the articles' titles and abstracts were examined to eliminate irrelevant papers between November 2020 and February 2021. Then, full texts were carefully inspected to decide on the final papers' inclusion list between February and June 2021. If different KPIs were used in more than one implementation in the same study, each was counted as a different implementation. In comparison, implementations using the same KPIs in other locations or times in the same research were considered one implementation. The authors of studies with no available full texts or with partially reported results were contacted for missing data.

3.2.3 Data extraction process

Data extraction was performed between June and July 2021 and then compared to discuss differences. The following data were extracted from the eligible studies: 1) author/s, 2) year of publication, 3) country of origin, 4) data collection duration, 5) data collection tool, 6) the number of perspectives, 7) the number of KPIs, 8) availability of weights/importance for perspectives or KPIs, and 9) outcome, which is represented in the KPIs that have been used and their weights/importance. The frequency of each KPI used at each implementation was plotted in Microsoft Excel, and the sum was calculated. In addition, the weight/importance assigned for each KPI at each implementation was reported on a scale of 100%. In the case of studies that did not give weights/importance explicitly, each KPI weight/importance was calculated by dividing one by the number of KPIs used in that study to assign an equal weight/importance for each KPI. Consequently, we computed an average of the weights/importance assigned for each KPI. Next, the thematic analysis was used for the categorization process; we performed regrouping and coding for the KPIs to find the frequency of use and the set weights/importance percentages for each dimension. The resulting major and sub-dimensions were listed and described between August and September 2021.

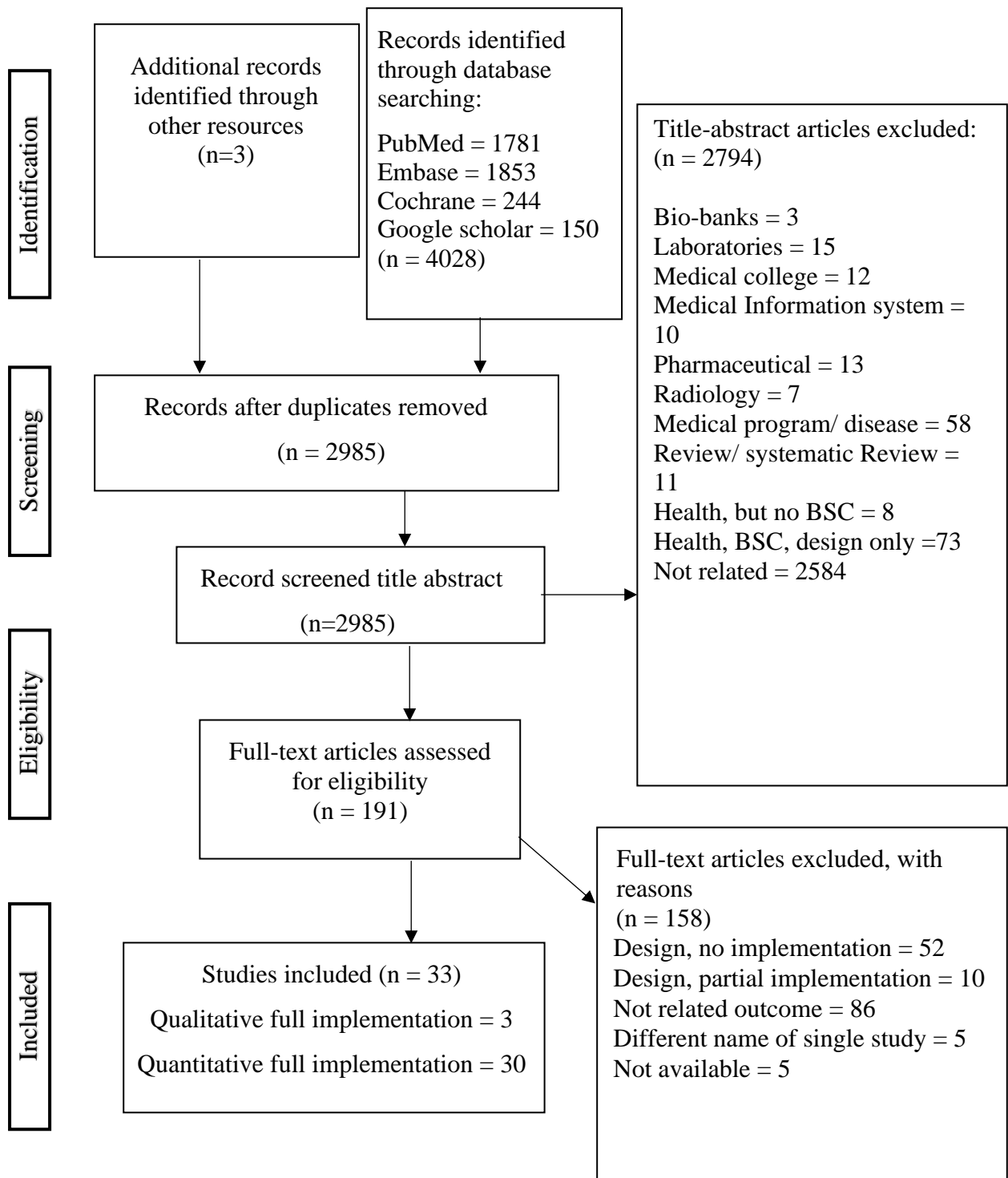


Figure 8. PRISMA flow diagram.

(Source: Own elaboration).

The research design of eligible studies was extracted directly from the studies. However, if the research design was not explicitly mentioned, we determined it based on the role of the investigator in that study. Specifically, the study was considered observational if the BSC exposures were naturally determined and the investigator had no part. On the other hand, the study was considered experimental if the investigator actively assigned the BSC intervention.

3.2.4 Quality assessment

The same methodology that was utilized in the first systematic review [25] was also used to assess the RoB for the resulting studies in this review.

3.3. Results

3.3.1 Study selection

A total of 4028 studies resulted from running the search strategy in the four databases. In addition, another three studies were identified through a Google search. Therefore, a total of 4031 studies were included. Duplicates were removed (n=1046) using the EndNote program, and then the remaining articles were screened based on their titles and abstracts (n=2985). Irrelevant papers were excluded (n=2794). Consequently, the remaining 191 studies were examined by reading the full texts. Among these papers, 22 papers were written in non-English languages, including Spanish, German, French, Chinese, and Persian. A full-text translation was performed for each study to decide whether to include or exclude any of them. As a result of reading the full texts, 158 studies were excluded, and only 33 were eligible for this review, in which 36 full implementations of different BSC designs were actually applied. *Appendix A5* shows a summary of the 36 implementations. Details of the study selection process are shown in the PRISMA flowchart [70].

3.3.2 Study characteristics

Of the resulting 36 implementations, one was in Spanish [101], one was in Persian [102], and the rest were in English. The 36 implementations were performed in various countries: 19 in Asia [79,81,84,91,102–114], seven in North America [86,92–94,115–117], six in Europe [85,101,118–120], three in Africa [80,121,122], and one without location information [123].

Twenty-one implementations were performed in hospitals (secondary and tertiary HCOs) [43,84–86,91–94,101–104,109,110,112,115,117–120] and 15 in medical centers or health facilities (primary HCOs) [79–81,105–107,111,113,114,116,121–123]. Two studies [106,119] included three and two implementations, respectively, with different KPIs per implementation. Thus, the 33 resulting studies contained 36 unique implementations. No BSC implementation in the COVID-19 era was found.

The 36 BSC implementations varied in their designs. However, most studies did not explicitly report their study design. We categorized the 36 implementations based on the active role of the investigator in BSC implementation and the time of data collection. Consequently, one sole study design was an RCT [80]. Moreover, 14 implementation designs were uncontrolled quasi-experiments. Specifically, six implementations had a posttest-only design [103,104,108,118,120,122]. Five implementations in four studies had pretest-posttest designs [85,102,110,119]. Finally, three implementations interrupted the time series design [84,116,124]. On the other hand, 20 implementations were observational; six implementations in four studies were cross-sectional [105–107,115], one implementation was prospective [98], ten implementations were retrospective [79,81,91,93,111–114,117,121], and two implementations were prospective and retrospective [92,94]. Finally, one implementation did not have sufficient information or reported the study design [123].

3.3.3 Decision model

One study [120] integrated multiple-criteria decision analysis with the BSC which was referred to as S-MEDUTA. Another study [103] integrated the BSC with fuzzy analysis. Two studies [84,108] combined BSC with AHP, and one [59] used the technique for order of preference by similarity to the ideal solution. Studies explained that using these methodologies with the BSC would help them arrive at more informed and better decisions.

3.3.4 Perspectives' frequency of use and importance

A total of 797 KPIs were extracted from the resulting implementations. These KPIs were categorized in the studies under 15 perspectives. The average number of perspectives used per study was 4.5, and for the KPIs, it was 22. The most frequently used perspectives were the internal, financial, patient, learning and growth, HCW, managerial, community, and stakeholder perspectives. The total use frequencies of these perspectives at the implementations were 29.6%, 17%, 12.6%, 12.6%, 9.4%, 6.3%, 5%, and 3.1%, respectively. On the other hand,

the topmost important perspectives from the health managers' viewpoint were the internal, financial, learning and growth, patient, HCW, community, managerial, and stakeholder perspectives with a total weight/importance of 37.9%, 15.4%, 12%, 11.3%, 7.8%, 7.7%, 3.6%, and 2.8%, respectively.

3.3.5 Categorization and regrouping of KPIs into dimensions/ sub-dimensions

The 797 extracted KPIs were plotted according to their frequencies and weights/importance. Grouping and recategorizing KPIs resulted in *Figure 9* and *Figure 10* below, showing 13 major dimensions and 45 sub-dimensions based on their frequency of use and importance, respectively. After regrouping these KPIs into homogenous major dimensions and sub-dimensions, 13 major dimensions resulted, with 45 sub-dimensions. A summary of the resulting perspectives and their major and sub-dimension contents are illustrated in *Figure 11*. The description of each major and sub-dimensions is described further in *Appendix A6*.

3.3.6 Quality assessment

Each study was evaluated in terms of RoB, as illustrated in *Appendix A7*. The RoB-2 tool was utilized to assess the ROB in the sole RCT study [80], for which the assessment showed fair evaluation, except for performance bias. On the other hand, utilizing the ROBINS-I tool for assessing the RoB in observational and quasi-experimental studies revealed no information about confounder adjustment methods except in three studies [84,86,91]. The confounding agents were apparent in the three studies; one study [86] performed confounder adjustments. On the other hand, another [91] adjusted for patient severity but not for the LOS and mortality rate. Last, one study [84] did not perform adjustments at all, which may have affected measurement precision.

The selection bias across studies reflected a serious RoB in five studies [84,91,95,105,109]. Therefore, the intervention and the follow-up did not coincide, and a potentially substantial amount of follow-up was missing in their analysis. Studies with a moderate risk of intervention/exposure measurement bias reflected a well-defined intervention

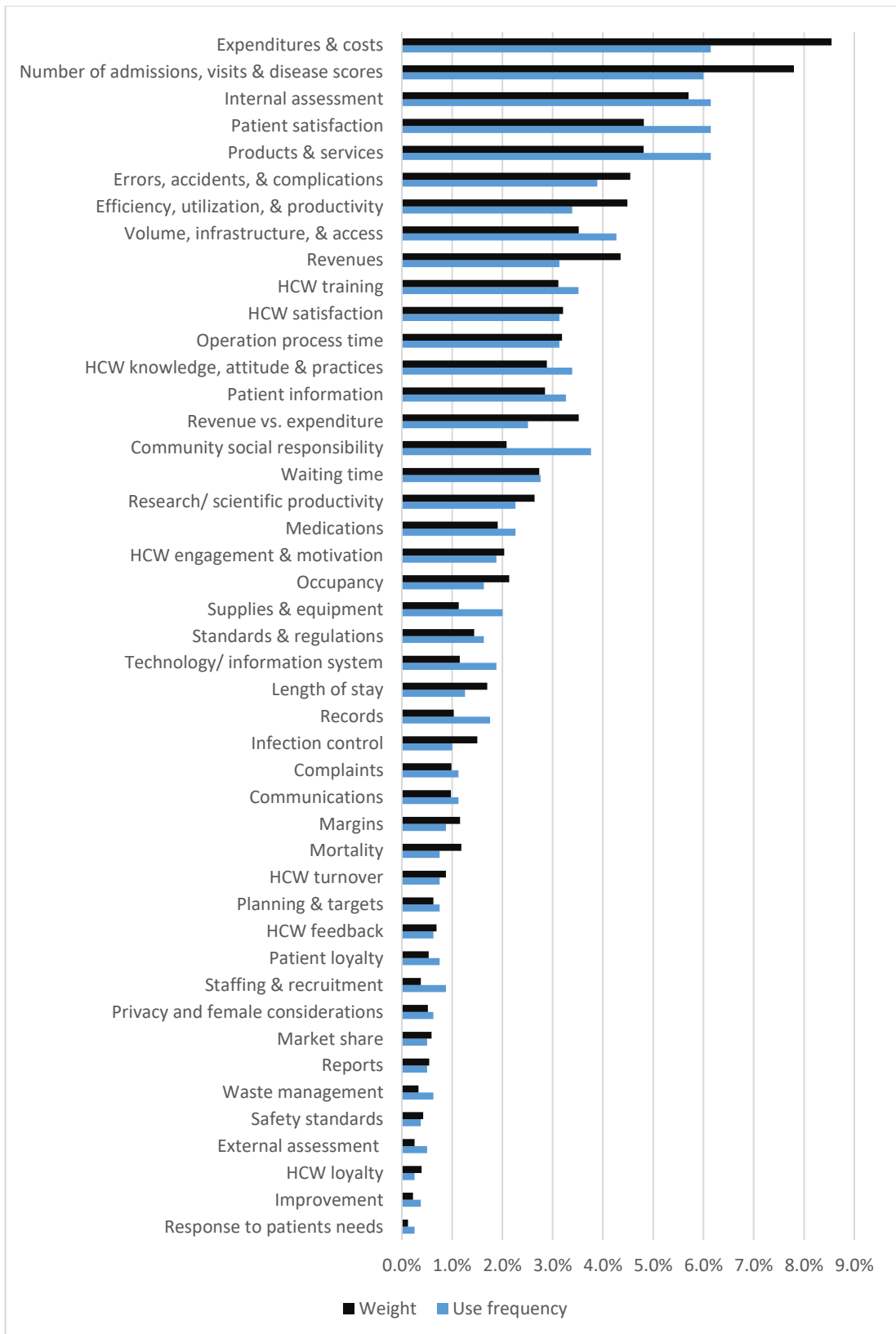


Figure 9. The BSC 45 sub-dimensions.

(Source: Own elaboration). Note: After regrouping the 797 indicators, 45 sub-dimensions resulted. This figure shows the frequency and the weight/importance for each sub-dimension independently.

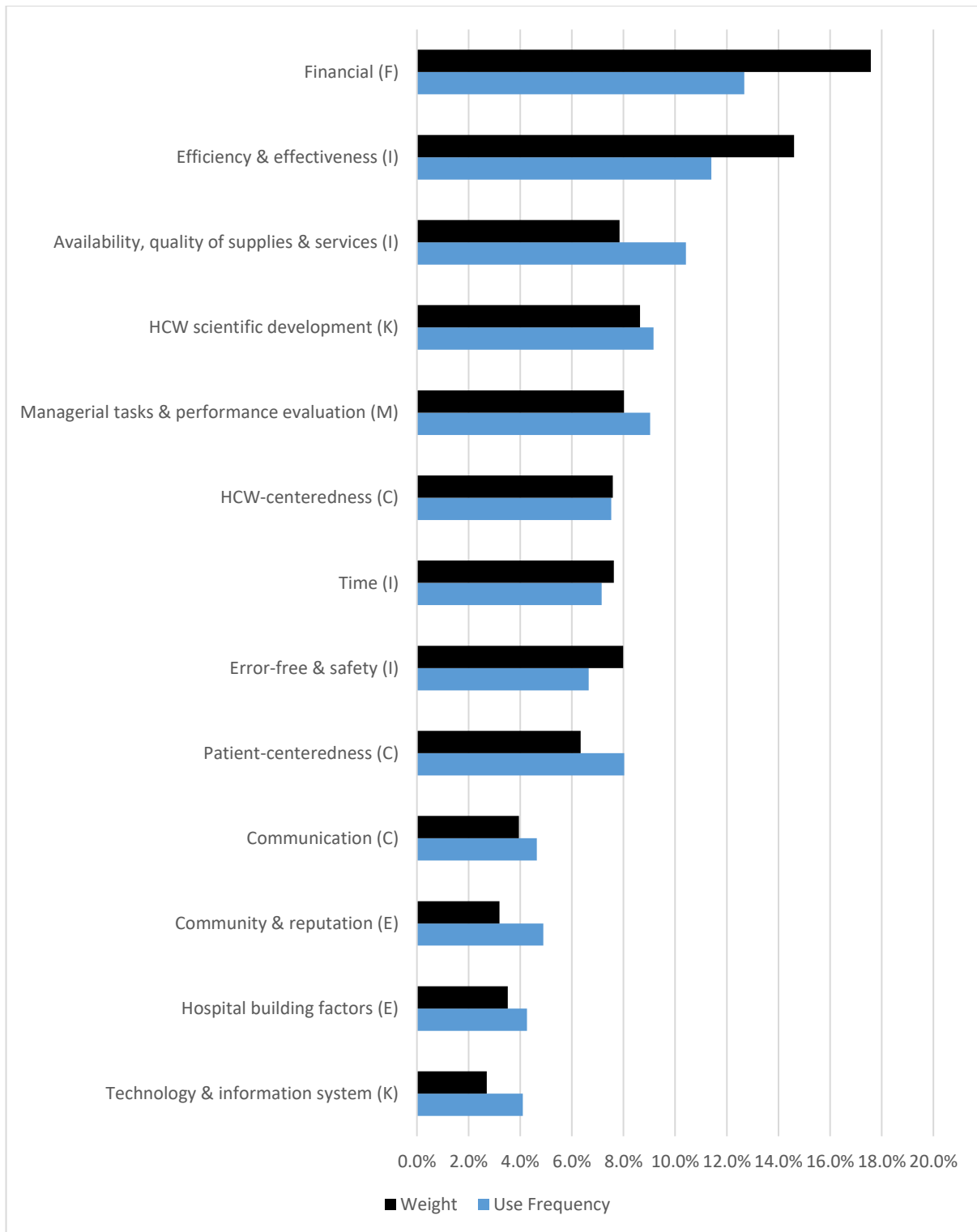


Figure 10. The BSC 13 major dimensions.

(Source: Own elaboration). Note: Reassembling the 45 sub-dimensions resulted in 13 major dimensions. This figure shows the frequency and the weight/importance for each major dimension independently. (F), Financial perspective; (I), internal perspective; (K), knowledge and growth perspective; (M), managerial perspective; (C), customer perspective; (E) external perspective.

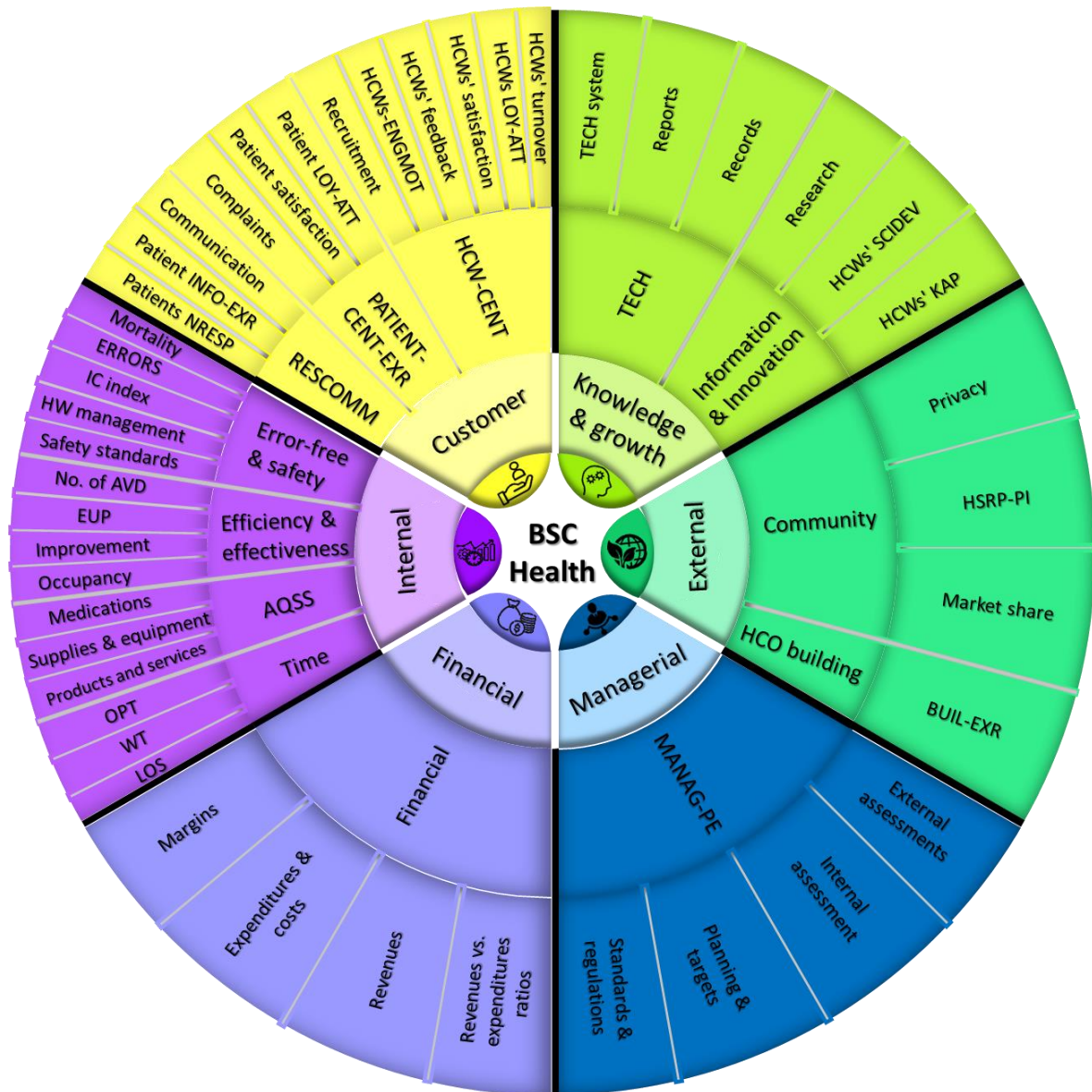


Figure 11. A summary of BSC perspectives in healthcare and their contents.

(Source: Own elaboration). Note: BSC, balanced scorecard; HCWs, healthcare workers; HCOs, healthcare organizations; IC, infection control; HW, health waste; WT, waiting time; LOS, length of stay; KAP, knowledge, attitudes, and practices; TECH, technology; HSRP-PI, hospital social responsibility perceived image; ERRORS, errors, accidents, and complications; No. of AVD, the number of admissions, visits, and diseases; EUP, efficiency, utilization, and productivity; AQSS, availability and quality of supplies and services; OPT, operation processing time; RESCOMINF, needs-response, communication, and information provision; PATIENT-ATTs, patient attitudes; HCW-ENGMOT, healthcare workers' engagement and motivation; HCW-CENT, healthcare workers-centeredness; MANAG-PE, managerial tasks and performance evaluation; HCW-SCIDEV, healthcare workers' scientific development; INFO-EXR, information experience; LOY-ATT, loyalty attitude; BUIL-EXR, building experience; REPUT, community and reputation; NRESP, needs-response.

status, but some aspects of the assignments of intervention status were determined retrospectively. Furthermore, bias in selecting the reported results was serious in one study that partially reported the results [109]. Studies that reported all results but did not have a preregistered protocol or whose outcome measurements were not defined in an initial plan were given a moderate risk (*Appendix A7*).

3.4. Discussion

3.4.1 Discussion of the main results

All the perspectives, dimensions, and KPIs employed in BSC implementations were collected to fulfill the research aims. Categorization and regrouping of the KPIs into major and sub-dimensions were performed. Then, the dimensions were ranked according to their frequency of use and importance. The BSC tool can offer comprehensive planning, monitoring, evaluation, and improvement of HCO's KPIs. Hence, their performance should be improved in the short and long term.

3.4.2 Overall completeness and applicability of evidence

Analyzing the results showed that BSC implementations typically utilized four fundamental perspectives: financial, customer, internal, and knowledge and growth. However, the analysis of *Figure 10* revealed the frequent employment and the importance of other BSC perspectives in BSC implementations. Specifically, the external and managerial perspectives. This reflects the need for slight modifications of BSC design and corresponds with the findings of another study [125], which referred to the sustainability perspective of the BSC as the fifth pillar. Additionally, our findings reveal that focusing on both internal and external customers from the customer perspective is essential.

The variation among BSC implementations in the categorization of the same KPIs reflects the need for data standardization. HCWs' training-related KPIs, for example, were categorized under the learning and growth perspective in almost half of the resulting studies [79–81,84,85,91,93,103–108,111–114,117,119,121]. Meanwhile, the rest of the studies categorized them under the perspectives of HCWs [80,121], quality [116], service capacity, provision/service capacity [81,105,111,112,114,121], and healthcare facility functionality [107]. These results are consistent with a study [7] that referred to the lack of defining measures and the lack of data standardization. The differences in categorization prove our assumptions in the calculation imprecision in the previous reviews. Specifically, in the use frequency or the

importance of the perspectives and KPIs. Our systematic review solved this calculation bias by uniformly forming 797 KPI categorizations. Regrouping similar or semisimilar KPIs under the same category resulted in more precise results. The unification of dimensions can guide uniform future implementations of PE or BSC at HCOs, allowing data sharing and comparability. Dimension unification can be why our findings are different from another systematic review [126] that did not consider unifying the classification of KPIs. According to HCO management, the average LOS, health-associated infections, patient satisfaction, bed occupancy, and bed turnover rate were the most useful KPIs. Analyzing the results also shows a lack of BSC utilization in HCOs during the pandemic. Additionally, there has been a lack of studies comprehensively examining the impact of COVID-19 on KPIs.

This review can guide healthcare managers and researchers since the resulting dimensions can be utilized to synthesize future BSC measurements. Specifically, the dimensions can direct the creation of new instruments to engage stakeholders in future BSC implementations. Moreover, this review can provide a road map for healthcare managers to perform a comprehensive PE of HCOs during the COVID-19 pandemic. Since the COVID-19 pandemic may influence the BSC dimensions positively or negatively compared to the pre-pandemic, analyzing the effect of the pandemic on the performance of the major and sub-dimensions will allow HCO managers to better understand where to focus on their action plans to improve the overall performance of HCOs.

3.4.3 Implication of the resulting dimensions during the COVID-19 era

Although this systematic review included ten months after the initiation of the COVID-19 pandemic, no research on BSC utilization in COVID-19 was found. Moreover, health policy experts stated that insufficient standardization of quality measurement approaches in the COVID-19 era challenged sharing purposes. As a result, the comparison between the performance of healthcare systems is disrupted [7]. Comparison is critical in cases where the optimal performance is not fully understood as in pandemics, and a comparison with other health systems would be informative and necessary [7]. Therefore, addressing the lack of data standardization was suggested to be overcome by quickly defining measures, which could allow health systems, at least in the short term, to use standardized methods to better understand their performance [5].

We pursued further analysis in this paper based on independent studies per resulting dimension during the COVID-19 era to highlight how these dimensions can be utilized to

monitor and improve HCO performance during the COVID-19 pandemic. For an overall summary, see the second implementation (*Chapter 8: Theoretical and practical implications*).

3.4.3.1 The managerial tasks and PE dimension

Standard policies, procedures, the availability of written standardized guidelines, and delivery in full and on time were considered essential in tackling COVID-19 [8]. A lack of standardization capability and conflicting or irrational managerial decisions were deemed dissatisfactory factors for HCWs during the pandemic [127].

Planning and preparedness are also crucial managerial tasks. The CDC developed a checklist to help hospitals assess and improve their preparedness for responding to COVID-19 [128]. Hospitals utilized a collection of some of the previously explained KPIs and dimensions to perform planning and internal assessment of their performance [129,130].

Few studies [131,132] have examined the impact of centralized governance on HCOs during the pandemic, which positively affected reactive strategies. Learning from past pandemics also positively influences proactive and reactive strategies [132]. However, the role of internal MANAG-PE, such as using BSC or Malcolm Baldrige National Excellence Model tools, or external assessments, such as Joint Commission International (JCI) accreditations, ISO certification, auditing, or peer review on HCOs during the pandemic, still requires more investigation.

3.4.3.2 The financial major dimension

Due to COVID-19 hospitalizations at the beginning of the pandemic, health policy experts suggested that HCOs in some regions will have more significant revenue and greater costs related to additional HCWs and resources. In contrast, other hospitals will experience mostly sharp reductions in elective and outpatient payments, which will create unprecedented financial challenges for HCOs [133]. However, in addition to the higher costs of HCWs and resources, researchers found higher costs of treatment due to extra diagnostic tests and isolation costs [134].

In the United Kingdom, the total expenditure on the NHS has increased significantly during the pandemic [135]. They made funding upgrades to expand waiting areas and treatment cubicles [136]. Some studies have focused on cost-effectiveness calculations. A study in South Africa indicated that purchasing intensive care unit (ICU) capacity from the private sector during COVID-19 surges may not be a cost-effective investment [137]. To date, there is still a

lack of studies that address the financial dimension or develop cost-saving strategies at the health organization level in COVID-19.

3.4.3.3 The error-free and safety major dimension

This dimension includes monitoring, analyzing, and comparing mortality rates and investigating their determinants in HCOs. Although mortality may not be directly related to errors, mortality rates higher than the average can reveal an underlying mistake. A cohort study in Mexico City [124] found that the mortality rates at the hospital's ICU and non-ICU departments were similar. The reason behind this finding was the ICU bed's unavailability. Approximately 45% of the patients who did not survive did not receive an ICU bed, which raised the mortality rate in the non-ICU admitted patients. However, this study revealed that the leading cause of non-ICU admission was acute respiratory distress syndrome. The leading cause of mortality for admitted patients was septic shock, followed by acute respiratory distress syndrome and multiorgan failure.

The World Health Organization has provided clear guidelines for IC for healthcare when COVID-19 is suspected or confirmed [138]. Patient safety was investigated in a systematic review of Indian-related studies [139]. Patient safety was negatively impacted during the COVID-19 pandemic due to inadequate preparation of the healthcare system, such as infrastructure and human and material resources. Additionally, researchers categorized diagnostic errors that could occur during the COVID-19 pandemic into eight types and suggested how to reduce them [140].

However, many studies have shown improvements in this dimension during the pandemic. A study in the United Kingdom [141] found a significant increase in the safety attitude questionnaire scores of doctors and other clinical HCWs and no change in the nursing group. It also showed a significant decrease in error reporting after the onset of the COVID-19 pandemic. Another study in Iran [142] found that health-associated infections during the pandemic were reduced, which could be referred to as the proper implementation of IC protocols. This finding is supported by a study in Ghana [143], which found that HCWs' compliance with IC was high during the pandemic.

The health waste (HW) management sub-dimension was intensively investigated due to the tremendous increase in HW volume during the pandemic [144]. A study in Iran [145] indicated that infectious waste increased by 121% compared with before the pandemic. Direct exposure of HCWs to virus-contaminated waste with inadequate safety measures and

mismanagement of HWs may lead to their infection and facilitate the transmission of COVID-19 [144,146]. The World Health Organization has provided clear guidelines for managing healthcare waste during the pandemic [147]. Nevertheless, many studies worldwide [146,148,149] have illustrated the existence of gaps and a flawed system for handling HWs during the pandemic.

A mini-review [144] of HWs during the pandemic showed that disinfecting waste, followed by proper segregation and on-site treatment, can also provide better and healthier HW management. It also revealed that surplus HW accommodation, mobile treatment, and temporary storage strategies might aid the sustainable management of healthcare waste without further spreading the virus. Another study in Brazil [148] proposed a model for the proper management of HWs. It focused not only on the operational management KPIs of HWs but also on environmental management, such as sustainable practices. Moreover, it highlighted the importance of employee training on HW guidelines since HW management was not considered an essential competence or a priority for every HCO.

3.4.3.4 The efficiency and effectiveness major dimension

Analyzing the number of patient visits and admissions in the United States of America, [150] revealed a decrease in ER visits and an increase in hospital admissions. However, another study in Alberta [151] reported decreased admissions and ER visits to the hospital, despite the low volume of COVID-19 hospital admissions.

Many studies have been performed to analyze the efficiency, utilization, and productivity of HCOs during the pandemic. A study [152] indicated that efficient hospitals under normal conditions lost their efficiency during COVID-19 and had to adapt to the new criteria. A systematic review [153] showed that healthcare utilization decreased by approximately one-third during the pandemic, with more significant reductions among people with less severe illnesses.

A study at an isolation hospital in Egypt [154] utilized the DEA tool to improve efficiency. This confirmed that the number of nurses and the number of beds impacted the operational efficiency of COVID-19, while the number of physicians had no significant effect on efficiency. These results are compatible with a study in Mauritius [21] that found that nurses and beds are the most critical factors in hospital production; that is, a 1% increase in the number of beds and nurses resulted in an increase in hospital outputs by 0.73 and 0.51%, respectively.

3.4.3.5 The availability and quality of the supplies and services (AQSS) major dimensions

The AQSS dimension was considered important in tackling COVID-19 [6]. This dimension includes evaluating the availability and quality of COVID-related medications, masks, personal protective equipment, detergents, medical services, supportive services, etc. Additionally, researchers viewed the availability of both clinical and supportive services at hospitals as essential in responding to the COVID-19 pandemic and the flow of COVID-19-positive patients [155]. The spectrum of supportive services to a hospital encompasses linen and laundry, diet, central sterile supply department, transport, consumables in large quantities at hospital stores, mortuary, and engineering services [155]. Some of the essential items were filtering face-piece respirators or N95 respirators and the availability of personal protective equipment kits [155]. The global challenge during this pandemic in terms of inadequate availability of personal protective equipment in HCOs highlighted the vital role of the central sterile services department. Centers for Disease Control and Prevention (CDC) suggested a method of decontamination, and the reuse of filtering face respirators to overcome the shortage of these respirators is their extended use or reuse [155].

However, researchers have referred to the lack of studies on the quality of supplies and services at HCOs during COVID-19 [7]. The lack of studies can be referred to as data lag in pandemics: the time between care provision and quality measurement reporting [7]. Policymakers suggested that measures should be less reliant on claims data, which by nature have a time lag, and focus on actions that can be generated from the electronic health record [7].

3.4.3.6 The time major dimension

An "extra layer of processes" was added due to the donning and doffing protocols and cleaning requirements, which slowed all the operational processes down and increased the time required to accomplish serving medical care to patients [135]. Patient WT was also influenced. In the United Kingdom, WT reached high levels in studies with a notable impact on elective surgery. The number of patients who waited for more than a year to receive NHS treatment in July 2020 was 81-fold greater than the previous year's number [136].

Moreover, the patient length of stay (LOS) also increased for another 2–3 days. A reason for this was the delays in COVID-19 testing results [156]. The LOS in the United States of America was two days more than that in Italy and five days less than that in Germany [157].

A systematic review of patient LOS in COVID-19 [158] concluded that LOS in China was longer than that in any other country, referring to differences in criteria for admission and discharge and different timings within the pandemic. Another study [157] found a negative association between the LOS and the case fatality rate. Therefore, LOS estimation can be introduced as a KPI to scale the success of countries fighting the ongoing pandemic.

Moreover, LOS provides insights into when hospitals will reach capacity and predicts associated HCWs or equipment requirements [158]. Discharge status should be considered when analyzing LOS since patients who are discharged alive have a longer LOS than those who died during their admission [158]. Hospitals reported that health insurance plans resisted paying for additional patient days in the hospital while awaiting COVID-19 test results [156].

However, complying with the CDC guidance on testing and disposition of patients was suggested to reduce the patient LOS, freeing up hospital beds for incoming COVID-19 patients [156]. Another study in the United Kingdom [156] indicated that due to the complexity and partiality of different data sources and the rapidly evolving nature of the COVID-19 pandemic, it is most recommended to use multiple LOS analysis method approaches on various datasets.

A combination of an accelerated failure time survival model and a truncation-corrected method with the multistate survival model was found to be helpful in epidemic planning and management. Finally, the findings of a cohort study [159] concluded that a multi-mechanism approach effectively decreased the average LOS in the ICU by 5.4 days and up to nine days in older patients. This finding suggests that implementing this treatment protocol could allow a healthcare system to manage 60% more COVID-19 patients with the same number of ICU beds.

3.4.3.7 The HCW-centredness (HCW-CENT) major dimension

Physicians referred to the importance of reliable acknowledgment and emotional motivation as well as the FINI, considering the sacrifices they provide every day [127]. In parallel, staffing and recruitment of an adequate number of medical and nonmedical HCWs were considered important KPIs for the PE of HCOs during COVID-19 [8]. In the United Kingdom, the NHS employed strategies to facilitate the staffing process due to the shortage of HCWs. First, newly qualified/final-year medicine and nursing students were recruited. Second, the return of the former HCWs was made [160].

The HCWs' satisfaction rate and burnout have been evaluated in many studies during the pandemic. A study [127] showed that the prevalence of burnout among physicians was

57.7% during the pandemic, which is considered high. HCWs who lack personal protective equipment reported lower occupational satisfaction than those who did not [127,161]. HCWs' accomplishments during the pandemic were positively associated with higher occupational satisfaction rates [161]. Therefore, emphasizing HCWs' accomplishments leads to increased satisfaction rates.

Moreover, as mentioned earlier, better performance of the MANAG-COMM dimension, including psychological support, will raise HCWs' satisfaction and lower the rates of burnout and stress [161,162]. Some HCWs felt anxiety and fear mainly due to the possibility of transmitting the virus to their family members and the elderly living in their houses [127]. A study in Canada [6] showed that HCWs' training and counseling services were perceived as helpful in reducing HCWs' stress. Nevertheless, they were underutilized in HCOs.

On the other hand, although most nurses had to increase their workload due to staff shortages, a study [161] found that the elevation of the workload was not associated with lower occupational satisfaction. Additionally, another study in Singapore [163] found that HCWs burnout was similar to the pre-pandemic rates. Nevertheless, the HCWs' vaccination, HCW-ENG, motivation, teamwork, and LOY-ATTs sub-dimensions and their impact are still not well investigated during the pandemic.

3.4.3.8 The PATIENT-ATTs major dimension

Many studies have been conducted to evaluate patient satisfaction. A study [164] indicated no difference in patient satisfaction during the period spent in the emergency room before and during the pandemic. Another study [165] showed positive patient experience and satisfaction rates in Saudi Arabia's largest institutions during the pandemic. Moreover, many studies have focused on the psychological assessment of the impact of COVID-19 on the general population. However, few studies have focused on specifically assessing the psychological effects on patients. For example, a study [166] found that COVID-19 patients with low education levels and females who have undergone divorce or bereavement tended to have a high prevalence of adverse psychological events. Another study [167] found that the psychological consequences of the pandemic were better handled by cancer patients 65 years of age or older, while younger cancer patients were more psychologically affected. Early psychological status identification and intervention should be conducted to avoid extreme events such as self-mutilating or suicidal impulsivity for patients [166]. Patient complaints and

LOY-ATTs assessment during the pandemic and the psychological impact of COVID-19 on non-COVID-19 patients still need more investigation.

3.4.3.9 The needs-response, communication, and information provision (RESCOMINF) major dimension

The main goal of HCO was considered to provide high-quality care to patients, including patient needs-response (NRESP), during an outbreak such as COVID-19 [152]. Moreover, dialog and listening to the health demands of COVID-19-suspected patients were highlighted as the foremost step in the flow of care and guidance [168].

Communication among HCWs was also highlighted. A study [6] considered HCWs' reception of family support, colleagues, support, clear communication, and COVID-19 information as the most valuable resources in the pandemic. Lower HCWs' psychological distress symptoms, burnout, and intentions to quit were perceived when these communication resources were more available. Another study [162] indicated that gratitude in MANAG-COMM could reduce depression in HCWs by promoting social support and hope. Patient NRESP with communication leads to better PATIENT-CENT-EXR.

In addition, RESCOMINF was also investigated during the pandemic. A study in Jordan [169] found that RESCOMINF positively affected the patient's psychological status during COVID-19. It recommended avoiding RESCOMINF errors using jargon, not being available to patients, and not showing empathy in communication. Additionally, it emphasized the benefit of physicians as excellent listeners to patients. However, RESCOMINF faced a few obstacles during the pandemic. The protective equipment used by HCWs in the pandemic could have imposed a barrier to effective RESCOMINF or eye contact with them [170]. Some pediatricians reported difficulty communicating with families and following up with patients, especially newly discharged neonates and infants, using the telephone [127]. However, more research is still needed to improve and evaluate patient education programs, patient guidelines, counseling and consultation services, and RESCOMINF skills improvement during the pandemic.

3.4.3.10 The community and reputation (REPUT) major dimension

This dimension, including the hospital social responsibility perceived image (HSRP-PI) for HCOs facing a crisis, can be ambiguous to define and apply, so social sustainability indicators have been organized under the broad categorical concerns of well-being, values,

agency, and inequality [130]. Despite doctor–patient confidentiality clauses and the protection law for patient data privacy, the Department of Health and Social Care for England has relaxed the rules on sharing confidential patient data. It required HCOs and the NHS to exchange patient information to help fight COVID-19 [171]. Moreover, COVID-19 patient data have led to society breaching patient privacy in some countries [127,172], which may have stigmatized those patients [127].

As mentioned earlier, a study [148] emphasized the importance of sustainable environmental practices for better HW management. The political situation was also considered an external influence during the pandemic. It was highlighted in a study [69] in the Palestinian territories, which referred to the COVID-19 situation in the presence of the Israeli military occupation to have a double epidemic effect, which eventually impacted the performance of the Palestinian health system HCOs during the pandemic. However, factors such as exemptions offered by HCO for poor patients, HSRP-PI, patient privacy concerns, and HCO market shares in COVID-19 are still poorly investigated.

3.4.3.11 The HCO building's major dimension

Design and infrastructure preparation were considered essential dimensions in some HCOs during the pandemic [8]. Healthcare systems made adaptations in HCO buildings after the COVID-19 pandemic. Examples include expanding waiting areas, increasing ICU capacity, establishing isolation areas, and building new hospitals [136]. In the United Kingdom, the NHS temporarily used private hospitals to provide public care, increasing the number of beds, ventilators, and all HCW categories. Moreover, nonhospital sites were temporarily turned into hospitals [160]. However, researchers have not sufficiently investigated the ACC-EXR to HCOs during the pandemic.

3.4.3.12 The information and innovation major dimension

Due to the importance of HCWs' scientific development (HCW-SCIDEV), many studies have aimed to evaluate HCWs' knowledge, attitudes, and practices (KAP) at the beginning of the pandemic [173]. HCWs' adherence to infection control (IC) measures is affected by their KAP toward COVID-19 [174]. Some studies referred to insufficient knowledge about COVID-19 among nurses [175]. Surgeons were worried about losing their skills after months of lockdown due to paused practice [127]. However, HCWs were obliged

to learn digital health skills and effectively communicate with patients during the pandemic [127].

A study [176] found that COVID-19 and non-COVID-19 publication productivity correlates with some factors. For example, epidemiologic, healthcare system-related, and pre-COVID publication expertise factors. Therefore, countries with a stable scientific infrastructure appear to maintain non-COVID-19 publication productivity nearly per year. More incentives must be drawn by HCOs to their HCWs to encourage research and scientific productivity related to COVID-19.

3.4.3.13 The technology (TECH) major dimension

Experts emphasized the role of TECH in tackling COVID-19 as inevitable due to its importance in the response, prevention, preparedness, and recovery phases [177,178]. TECH system application varies from allowing HCOs to maintain and share studies to producing different reports and follow-up with pandemic analysis. Telehealth is another example that proved helpful during the pandemic. It allowed HCWs to provide care for patients without direct physical contact, especially to patients in quarantine, while keeping them safe [179].

Researchers summarized the emerging TECH used to mitigate the threats of COVID-19 in the following categories: artificial intelligence/deep learning, big data analytics, high-performance computing infrastructures, robots, 3D printing TECH, digital contact tracing TECH, blockchain [177], bioinformatics systems, telemedicine, mobile health (mHealth), decision support system, IC system in HCOs, online interactive dashboard/geographic information system, Internet of Things, virtual reality, surveillance systems, and internet search queries [177,178]

Governments, healthcare systems, and HCOs need to keep updated with the emerging technologies in this field, allocate resources to invest in them, and develop the required skills in HCWs to utilize them properly.

3.4.4 Strengths and weaknesses

We believe that this paper has several strengths. First, this systematic review includes all types of studies with BSC implementations, such as books, theses, conference papers, and letters to the editor. Second, this review contains all implementations despite the country, language, or HCO administrative type, which gives an advantage of generalizing results to HCOs worldwide. Third, unlike other BSC reviews [1,38], which included definitions of

biobanks, pharmacies, laboratories, radiology, and medical colleges in HCOs, this review limited the report to primary, secondary, or tertiary healthcare organizations. However, an initial assessment by top management to evaluate the importance of each dimension and KPI based on the health organizations' strategy could be needed. This strategy leads to the homogeneity of the resulting studies and to more valid comparisons among the results. Fourth, this review calculates the use frequency of perspectives and the weights/importance assigned to them. Fifth, the first review has uniform KPIs in homogenous major dimensions and sub-dimensions despite the categorization differences among implementations, yielding more precise results. The resulting KPIs and dimensions in this review can be generalized or replicable to other HCOs and hospitals. Finally, this study is the first to analyze the implications of BSCs in HCOs during the pandemic based on the literature. This implication provides a guide for future theoretical implications, such as performing systematic reviews for each major dimension during the pandemic. It also provides a guide for practical implications of BSC dimensions to assess HCOs' performance.

However, this systematic review has some limitations. First, unlike previous studies, it excludes some HCOs, such as laboratories, pharmacies, radiology departments, and biobanks, as specified in the inclusion/exclusion criteria. Therefore, our results cannot be generalized to such HCO types. However, we excluded them to arrive at more homogenous KPIs and dimensions that are directly related to HCOs that offer primary, secondary, and tertiary medical services. Second, it includes only the articles that report the complete implementations of BSC while excluding studies that display only the BSC design without reporting the full implementation results. Third, we extracted the KPIs from all resulting implementations despite their RoB. However, we included an ROB assessment for each implementation.

3.5 Conclusion

In conclusion, our review shows that the most frequently used perspectives in BSC papers were internal, financial, patient, learning and growth, HCW, managerial, community, and stakeholder perspectives. The perspectives that had the highest importance were internal, financial, learning and growth, patient, HCW, community, managerial, and stakeholder.

Moreover, this review solves the dilemma of the KPI categorization difference between BSC implementations by dimension unification into 13 major dimensions. The financial, information and innovation, TECH, efficiency and effectiveness, AQSS, error-free and safety, time, HCW-CENT, PATIENT-ATTs, RESCOMINF, REPUT, HCO building, and MANAG-

PE. The proper utilization of the 13 major dimensions and the 45 sub-dimensions will serve as a planning, monitoring, evaluation, and continuous improvement tool for HCOs, resulting in performance augmentation.

This research showed a lack of BSC utilization and any holistic PE approach in HCOs during the COVID-19 pandemic. Additionally, some dimensions that are essential for PE are still poorly investigated. Our analysis reflects that most KPIs were negatively affected during the pandemic, except IC and safety measures, which improved in some cases. However, a comprehensive PE of HCOs during the COVID-19 pandemic worldwide is still needed. Therefore, we recommend that future researchers perform a comprehensive practical PE for HCOs during COVID-19 using the measurements of the resulting dimensions. This analysis will provide a better understanding of the causal relationships between dimensions. It will also allow comparability of the interventions' outcomes, which will boost the performance and mitigate the consequences of the pandemic on HCOs. Moreover, researchers are encouraged to perform systematic reviews for each dimension, especially those that are already well investigated and the investigation of dimensions that are still poorly investigated but essential for PE. This theoretical implication will lead to performance enhancement and mitigate the consequences of the pandemic on HCOs.

Chapter 4: Engaging Patients in BSC implementations

(Sub-study 3): Assessing patient experience and attitude: BSC-PATIENT development, translation, and psychometric evaluation - a cross-sectional study³

4.1 Introduction

In our first systematic review, we were able to demonstrate that implementing the BSC positively improved the financial performance of HCOs [25]. Furthermore, we found that BSC was beneficial in enhancing the patient satisfaction rate. Additionally, BSC influenced the HCWs' satisfaction rate, but to a lesser extent [25]. Although BSC has a beneficial influence on patient satisfaction, prior implementations of BSC have solely focused on measuring patient satisfaction. One implementation at HCO in Afghanistan [106] created the community scorecard to include the community in the assessment of the BSC. However, none of the studies included patients in the process of evaluating BSC [25,26,30]. PATIENT-ENG in this process could result in even higher levels of patient satisfaction. In addition, it will assist HCO managers and researchers in better understanding the BSC strategic maps as well as the causal links between KPIs based on the perceptions of patients.

In contrast to other PE tools, which primarily focus on analyzing the internal perspective, the BSC is regarded as a comprehensive approach for PE, as it involves the analysis of six perspectives [26]. For that, BSC implementations utilized different sources to conduct the PE of HCOs [25,26], including hospital records, patient satisfaction questionnaires, patient and HCWs interviews, and observations. Additionally, BSC reviews [25,26] showed that only a few BSC implementations utilized validated scales to evaluate patient satisfaction, such as the Press Ganey questionnaires [83,92]. The patient satisfaction perspective is important since patients represent the hospitals' end receivers of healthcare services. However, researchers have pointed to the importance of PATIET-ENG in the process

³ **Amer F**, Hammoud S, Onchonga D, Alkaiyat A, Nour A, Endrei D, Boncz I (2022). Assessing Patient Experience and Attitude: BSC-PATIENT Development, Translation, and Psychometric Evaluation—A Cross-Sectional Study. *International Journal of Environmental Research and Public Health*. 19(12):7149. <https://doi.org/10.3390/ijerph19127149>. **Impact factor: 4.614**

of health policy planning, evaluation, and delivery improvement [31,32]. Additionally, patient feedback was proven to positively impact performance in HCO [69]. Strategies to support PATIENT-ENG include RESCOMINF skills improvement, managing patient conflicts and complaints, maintaining patient confidentiality, patient training, and asking patients to review outputs by assessing their perceptions and experiences [31,180]. It is not sufficient to perform the PE of HCO based on manager and hospital records only; a focus on PATIENT-ENG among the selection of the KPIs at HCO was recommended [32]. However, BSC reviews referred to the lack of patient and family member involvement in the evaluation process of BSC [25,26,30].

The first aim of this research was to develop a comprehensive instrument which engages patients in a comprehensive assessment of BSC perspectives and dimensions (BSC-PATIENT), and can assess the following: 1. PATIENT-EXR in light of BSC perspectives, 2. PATIENT-ATTs include patient PI and BSCP-ATTs, such as patient satisfaction and LOY-ATT. The second aim of this research was to customize the developed instrument at Palestinian hospitals, translate it into Arabic, and validate it.

4.2 The conceptual framework

In our conceptual model (*Figure 12*) we considered the impact of the BSC's six perspectives, which resulted in our second systematic review and their underlying dimensions [26]. We also built it based on the psychological definitions of experiences and attitudes [181,182] and the previous literature regarding PATIENT-ATTs [52,181,183–185]. Experiences and perceptions enable people to act in a particular behavior and develop a PI, satisfaction, or LOY-ATT [182].

4.2.1 The experiences

The experience is defined as an event that was lived through [182]. PATIENT-EXR at HCO is formed upon receiving the healthcare service or treatment. Becoming aware of events, objects, or relationships utilizing senses or observation results in experience perceptions [182].

4.2.2 The attitudes

Attitudes form directly as a result of experiences. There are three types of attitudes, which are sometimes referred to as the ABCs of attitude. First, the affective component is how the object, person, issue, or event makes someone feel. The behavioral component is how

attitude influences someone's behavior. The cognitive component is someone's thoughts and beliefs about the subject. Examples of attitudes are PI, satisfaction, and LOY-ATT. Such evaluations are often positive or negative, but they can sometimes also be uncertain [181].

4.2.2.1 Patient satisfaction attitude

Satisfaction is the most commonly used metric by managers to assess customer perceptions [183]. Satisfaction does not always lead to LOY-ATT. However, LOY-ATT often begins with a sense of satisfaction [184]. Studies have found that patient satisfaction either plays a direct impact on LOY-ATT or acts as a moderating variable between service quality and LOY-ATT [52].

4.2.2.2 Brand preference attitude

Brand preference is the degree to which consumers prefer a specific brand relative to competing alternatives. It is considered an essential component of customer LOY-ATTs [183].

4.2.2.3 Perceived quality (PQ) attitude

Studies have proven that PQ exerts an indirect influence on patient LOY-ATT. A rival hypothesis referred to satisfaction as a mediator between PQ and LOY-ATT [52].

4.2.2.4 PI attitude

A hospital PI was defined as the sum of beliefs, ideas, and impressions that a patient holds toward a particular hospital [186]. Patients usually form a PI of a hospital from their own past treatment experiences relative to the PIs of competing hospitals [185]. A positive bank PI was found to significantly improve PQ. Therefore, in healthcare, a positive hospital PI may positively influence PQ. However, a recent review showed that this has not yet been studied [185].

4.2.2.5 LOY-ATT

LOY-ATT is behavioral intentions that reflect faithfulness and allegiance to something [182]. In the marketing management field, Kotler and Keller (2015) defined LOY-ATT as a deeply held commitment to rebuy or patronize a preferred product or service in the future despite influences that cause switching behavior [187]. A study revealed a need to use multiple indicators to predict customer loyalty behavior, such as customer satisfaction, brand preference

against competitors, intention to return or repurchase, and willingness to recommend [183]. Moreover, customer behavior trends in the past were a good predictor of future customer behavior. It is important to emphasize that loyalty refers to customers' actual conduct, regardless of their attitudes or preferences. However, assessing customers' LOY-ATT can help predict their loyalty behavior in the future [188]. The repurchase intention and willingness to recommend attitudes are examples of LOY-ATT [183].

4.2.2.6 Repurchase intention attitude

Researchers have used repurchase intentions to help predict future purchasing behavioral intentions and LOY-ATT [183]. On the other hand, customer retention behavior is defined as customers stating the actual continuation of a relationship with the organization. It is well known in marketing that past customer behavior tends to be a relatively good predictor of future customer behavior. However, most researchers focus on assessing repurchase intention attitudes and neglect to assess actual customer retention behavior [183].

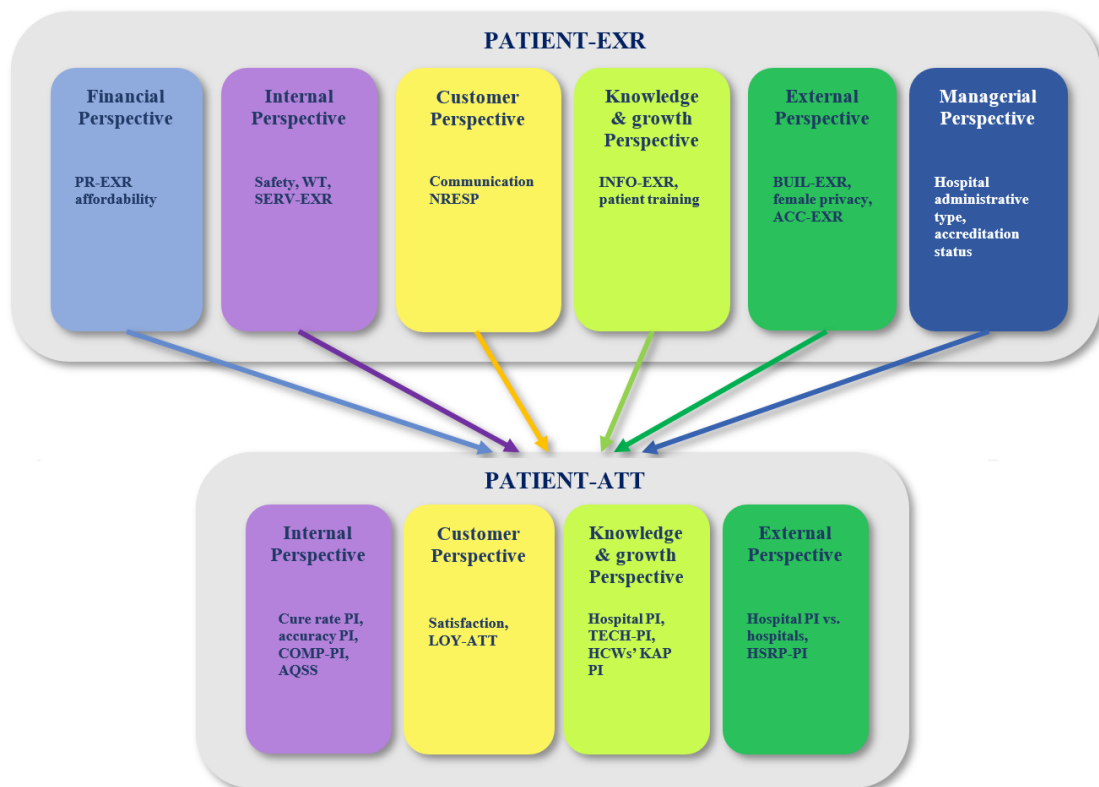


Figure 12. BSC-PATIENT conceptual model.

(Source: Own elaboration). Note: PR-EXR, price experience; PATIENT-EXR, patient experiences; PATIENT-ATTs, patient attitudes; PATIENT-CENT-EXR, patient-centeredness care experience; INFO-EXR, information experience; ACC-EXR, hospital accessibility experience; BUILCAP-EXR, building capacity experience; BUILENV-EXR, building environment experience; PI, perceived image; COMP-PI, complication perceived image; PQ, perceived quality; TECH-PI, technology perceived image; KAP, knowledge, attitudes, and practices; LOY-ATT, loyalty attitudes; AQSS, availability, and quality of supplies and services; HSRP-PI, hospital social responsibility perceived image; WT, waiting time; SERV-EXR, services experience.

4.2.2.7 Willingness to recommend an attitude

Word-of-mouth intention has been of importance to researchers in the past 30 years. Thus far, there is very little scientific research relating the intention of the recommendation to the actual recommendations [183].

4.3 Methods

4.3.1 Research design

This is part of a broad project that aims to strategically develop Palestinian hospitals using the BSC. This research is a cross-sectional study reported using strengthening the reporting of observational studies in epidemiology (STROBE) guidelines [189]. The questionnaire was created and validated based on the key authors' Kaplan and Norton theoretical framework [20] and the best practices for developing and validating the health and behavioral scales [190].

4.3.2 Item generation

The first panel consists of two researchers in health management, two hospital managers who are also expert researchers in health management, and one expert in the BSC tool who provided expert input on all stages of instrument development. First, we performed a systematic review [26], in which 797 KPIs were extracted from 36 BSC implementations at HCO worldwide. Then, the categorization and regrouping of these KPIs resulted in 45 subdimensions and 13 major dimensions that are frequently used by healthcare managers and are important for PE and the strategic development of HCO [26]. Next, this panel performed a four-round Delphi method [191]. In the first round, the panel prepared a survey for hospitals' executive managers to rate the resulting 45 subdimensions on a 10-point semantic scale based on their importance for the strategic development of their hospitals. A description for each subdimension using the shortlisted KPIs was included in the manager survey. In the second round, the panelists reviewed the item face validity per subdimension [192]. Next, we asked a second panel consisting of 13 executive hospital managers from four Palestinian hospitals to answer this survey individually. Additionally, hospital managers were asked to mention whether they considered any other subdimension or KPI that was not listed as essential. The subdimensions with an average score above 0.7 were chosen for the next step based on their ratings. In the third round, the first panel reviewed the resulting important subdimensions at the previous step and decided which subdimensions the patients could be engaged in their

evaluation. As a result, 24 subdimensions resulted. In the fourth round, the panelists revised each item's wording and clarity for patients. As a result, 52 items remained. In the fourth round, the panelists rated the relevance and importance of each remaining item based on four- and three-point ordinal scales, respectively [193]. Next, we calculated the content validity ratio (CVR), the item content validity index (I-CVI), the scale content validity index (S-CVI), and universal agreement among experts for the content validity index (CVI-UA) to assess the content validity per item and scale [193]. Only the items rated 0.99 or above in CVR were included as per Lawshe guidelines [194]. However, dimensions that scored 0.80-0.99 indicated the need to be revised. For the CVI, items that scored less than 0.60 were eliminated. Items that scored 0.6-0.79 were revised [193] (*Figure 13*).

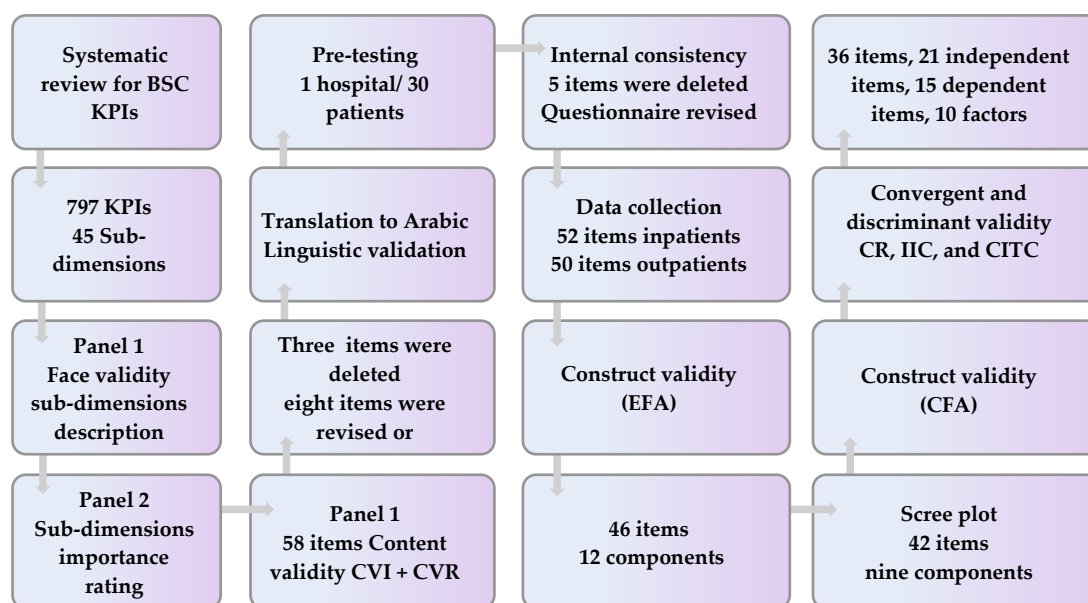


Figure 13. Flow chart for BSC-PATIENT development and psychometric validation.

(Source: Own elaboration). Note: BSC, balanced scorecard; KPI, key performance indicators; CVI, content validity index; CVR, content validity ratio; EFA, exploratory factor analysis; CFA, confirmatory factor analysis; CR, composite reliability; IIC, interitem correlation; CITC, corrected item-total correlation.

The panelists suggested using a three-point Likert scale: yes, neutral (I do not know), and no. This choice was due to the high number of the remaining items, the evidence of a high nonresponse rate of patients to the five-point Likert scale-validated tools [195–198], and the possibility of assessing item availability using yes/no questions. Additionally, this was found to lead to a faster and better item response, specifically considering the pandemic load on hospitals. All authors were asked to revise the instrument, and the final modifications were made accordingly.

4.3.3 Linguistic validation and translation

Since the dimensions resulting from the systematic review were in English, the questionnaire items were initially developed in English. Then, it was translated into Arabic. All translations were prepared as per the translation and validation guidelines [199]. We performed a final review to produce the final corrected translation. An expert checked the final form in the BSC, and minor modifications were recommended.

4.3.4 Pretest and internal consistency

The first version of the questionnaire was piloted in one NGO hospital in the south of West Bank. For that, 30 patients were asked to answer the first version of the questionnaire. They were asked to write their comments regarding language simplicity. The time needed to complete the questionnaire was also recorded. Items were coded before performing the analysis by IBM SPSS statistics 21 software. Then, Cronbach's alpha was calculated for each perspective to evaluate the internal consistency [200], and values above 0.6 were considered acceptable. Based on the results, some items were modified or deleted.

4.3.5 Sampling procedure and power calculation

Institutional review board (IRB) approval for this research was received on 31 May 2020. All methods described in this study were approved by the Research and Ethics Committee at the Faculty of Medicine and Health Sciences at An Najah National University with the reference code number (Mas, May/20/16). Afterward, requests at 15 hospitals in West Bank and three hospitals in Jerusalem were applied between June and December 2020. The hospitals were selected using a convenience sample. However, the total number of beds per administrative type and governorate was considered when choosing the participants (HCO and patients). Public hospital approval was first applied to the Palestinian Ministry of Health (PMOH). Then, the request was applied to each hospital individually for all hospital types. The final form of the questionnaire was distributed between January and October 2021. The sample size was calculated according to the Steven K. Thompson sample size equation [201]:

$$n = \frac{N \times p(1 - p)}{[N - 1 \times (d^2 \div z^2)] + p(1 - p)}$$

where n is the sample size, N is the population size, p is the estimated variability in the population (0.5), d is the margin of error (0.05), and the z score is at the 95% confidence interval (1.96). In our study, N was the population volume in the Palestinian territories [63]. Therefore, the needed sample size was found to be $n = 385$ patients. Additionally, studies considered 300 participants as a good sample size to successfully run each exploratory factor

analysis (EFA) and confirmatory factor analysis (CFA) or five respondents per parameter [202–204]. Splitting the sample to perform EFA and CFA is recommended to perform construct validity [205]. Therefore, a total of 1000 questionnaires were distributed, anticipating a lower response rate during the pandemic.

4.3.6 Data collection and participants

I collected the data with four medical students at An-Najah University after giving three hours of training on BSC and the data collection steps and ethics to each medical student. Tasks and hospitals were delegated to them according to their living area: eastern Jerusalem and north, middle, and south of the West Bank. The Gaza Strip was excluded due to the political situation and accessibility obstacles during the study. Moreover, five hospitals were excluded: two military hospitals that were not yet operating, one psychiatric hospital, and two rehabilitation hospitals. We sought variation in our sample regarding hospital size, area, and administrative type. For that, the maximum variation sampling strategy was used. The number of hospitals and the number of beds per administrative type were considered upon recruiting the sample [63]. Patients who existed in the targeted departments at the time of the visit were asked if they were willing to participate in the research.

Printed questionnaires were distributed to respondents instead of sending the questionnaires via email to reduce nonresponse bias [206]. Additionally, all participants were asked to agree on participation in a consent form that is coherent with the Declaration of Helsinki ethical principles [207]. Patients were informed that participation was confidential. Additionally, all patients were informed that participation was voluntary, so they could refuse participation in the study or withdraw at any time. To reduce the response bias [206], the “I don’t know (neutral)” answer was added as an option since experiences and attitudes can sometimes be uncertain [181]. Second, the data collectors ensured that the number of missing answers was minimized by checking the questionnaires upon retrieval. In case of missing parts, they drew the participant’s attention to answer them. When entering data, if any questions were found to be still missing, they were entered as I don’t know.

The inclusion and exclusion criteria were set to be a Palestinian patient above 15 years old of any gender. Outpatients should have finished receiving medical care at the assessed hospital or had received medical care at least once previously and returned to the same hospital. Inpatients should have been admitted for at least one day. The following departments were included: emergency room, internal medicine, surgery, gynecology, and pediatrics. In the emergency department, the questionnaires were completed by the patient companions.

Additionally, in the pediatric department, the questionnaires were completed by one parent of the child. For the rest, questionnaires were completed by patients themselves; unless they were unable to complete the questionnaire, the questionnaires were read to them by the data collector or a family member and completed according to patient answers. To distinguish, a question was added to ask the respondent if their responses were based on their own, family, or friends' experiences.

4.3.7 Statistical Analysis

Normality was tested using the Shapiro–Wilk test. The frequencies were used to analyze patient socio-demographics and the participating HCO characteristics. Our sample was split based on admission status to assess construct validity using EFA and CFA.

4.3.7.1 EFA

EFA was performed for the inpatient sample using principal axis factoring with the Promax rotation method [208] in IBM SPSS statistics 21 software. The Kaiser–Meyer–Olkin (KMO) and Bartlett's sphericity tests were tested to determine the adequacy of the EFA [209]. The inclusion or exclusion of a component was determined by an eigenvalue \geq one [210] and the visual assessment of Cattell's scree plot [211]. Item inclusion or exclusion was determined by a factor loading \geq 0.50 and factor loadings on the assigned factor higher than all cross-loading of other factors [203].

4.3.7.2 CFA

CFA was performed for the components that resulted in EFA using the outpatient sample. The maximum likelihood estimation method in the IBM Amos 23 Graphics software (IBM, Wexford, PA, USA) was applied. The goodness of fit for the competing models was evaluated through the most commonly used fit indices. Minimum discrepancies were divided by degrees of freedom less than five and closer to zero, *P* value higher than 0.05, goodness-of-fit index (GFI), comparative fit index (CFI), Tucker–Lewis's index (TLI), and cutoff values close to 0.95. Additionally, a root mean square error of approximation (RMSEA) $<$ 0.06 and standardized root mean square residual (SRMR) value $<$ 0.08 are needed before we can conclude that there is a relatively good fit between the hypothesized model and the observed data [212,213]. Item inclusion or exclusion in CFA was determined by a loading \geq 0.50.

4.3.7.3 Correlations

The interitem correlation (IIC) and the corrected item-total correlation (CITC) were calculated [214]. In this study, items with a correlation higher than 0.90 were considered redundant and deleted [215]. A correlation of 0.30 was considered the lower limit.

Additionally, the composite reliability (CR) per factor was evaluated after performing CFA. CR is preferred over Cronbach's alpha, specifically in structural equation modeling [216]. In the current study, a $CR \geq 0.60$ was considered sufficient [217,218].

4.3.7.4 Convergent and discriminant/divergent validity

The Fornell-Lacker criterion was used to evaluate convergent and discriminant/divergent validity [219]. The average variance extracted (AVE) was considered adequate for convergent validity if it was higher than 0.50 [219]. However, if a value < 0.50 with $CR > 0.60$, the convergent validity of the factor was still considered adequate [219]. To establish discriminant validity, the square root of the AVE (SQRT) should have a greater value than the correlations with other latent factors [217]. Additionally, factor uniqueness was evaluated depending on the value of Spearman correlation (r) with other factors at the same scale. Researchers have recommended the separation of dependent and independent variables since the correlation between them can be misleading in assessing discriminant validity [220]. Therefore, we assessed r for the independent and dependent factors separately. Then, r was described as negligible when $r < 0.20$, low ($r = 0.20-0.49$), moderate ($r = 0.50-0.69$), high ($r = 0.70-0.85$), or very high ($r = 0.86-1.00$) [221,222]. In this study, the absence of high or very high r between the subscale factors indicated discriminant validity [222].

4.4 Results

4.4.1 Item generation and scoring

The demographics and characteristics of the second-panel hospital managers are shown in *Table 2*. The content validity resulted in removing one item and indicated that a revision is needed for eight items. The revised items required either further clarification and rewording or modification for specific participants. For example, the CVR results indicated that financial and price items should not be included for nonprofit hospitals. Additionally, the CVI results showed that particular items were relevant only to inpatients. This step increased the S-CVI, CVI-UA, and CVR from 0.90, 0.63, and 0.95 to 0.95, 0.78, and 0.97, respectively.

4.4.2 The instrument's structure and items

The patient socio-demographics and hospital characteristics section included age, gender, scientific degree, working sector, insurance availability, and type. Moreover, the number of visits to the evaluated hospital compares the attitudes of the new and previous customers. The number of earlier visits is considered necessary in the analysis since past

customer behavior tends to be a good predictor of future behavior [181]. Moreover, the information source on which the respondent evaluation was built was recorded since perceptions and attitudes may emerge from direct personal experience or from observing other people's experiences, such as family and friends' experiences [106,182]. The second section of the questionnaire was designed to measure PATIENT-EXR in light of BSC perspectives and their attitudes toward them, including patient PQ, PI, satisfaction, and LOY-ATT.

Table 2. Sociodemographic and characteristics of the second panel (executive managers)

Sociodemographic characteristic	Panelists (N=13)	%	Sociodemographic characteristic	Panelists (N=13)	%
Age			Position		
30-39 years	4	30.7	CMO	3	23.1
40-49 years	7	53.8	CFO	3	23.1
60-69 years	2	15.4	CEO	3	23.1
Gender			Managing director	3	23.1
Male	7	53.8	Operation manager	1	7.7
Female	6	46.2	Highest degree		
Academic background			Bachelor degree	8	61.5
Medicine	4	30.8	Master's degree	5	38.5
Management	4	30.8	Administrative type		
Accounting	3	23.1	Private	4	30.8
Accounting and management	2	15.4	NGO	4	30.8
Years of experience			Public	5	38.5
5-10 years	1	7.6			
More than 10 years	12	92.3			

Note: CMO, chief medical officer; CFO, chief financial officer; CEO, chief executive officer, NGO, non-governmental organization.

4.4.2.1 The financial perspective

It evaluated the health services and medication's PR-EXR affordability. This section was answered only by patients who did not have insurance.

4.4.2.2 The internal perspective

This perspective assessed safety, time, and service availability. On the other hand, the PI of the complications (COMP-PI), cure rate, accuracy, and PQ of services and medication were measured in the attitude section. Finally, four items were reversed in the instrument, PIN9, which assessed the long WT-EXR. Additionally, PIN4, PIN5, and PIN6 assessed

readmission, referral to other hospitals, and postoperative infection probability expectations, respectively.

4.4.2.3 The knowledge and growth perspective

Information and training provided to patients were assessed in the experience section. Additionally, we assessed the PI of hospital TECH and HCWs' KAP in the attitude section.

4.4.2.4 The customer perspective

The PATIENT-EXR section assessed PATIENT-CENT-EXR, which included the communication and NRESP at the RESCOMINF subdimension. The attitude section assessed actual patient satisfaction and LOY-ATT. In previous studies, validated items for LOY-ATTs measurement included satisfaction measurement, recommendation, and return intentions [183,185]. Using a single item to directly assess actual patient satisfaction was suggested to be better than its assessment through multidimensional items [223].

4.4.2.5 The external perspective

It evaluated the hospital building environment experience (BUILENV-EXR) and building capacity experience (BUILCAP-EXR), ACC-EXR, and female concern experiences. On the other hand, a comparison with the other hospitals' medical and social PIs was included in the attitude section.

4.4.2.6 The managerial perspective

As there is no direct contact experience between patients and hospital managers, we evaluated the hospital administrative type and the accreditation status from this perspective. Therefore, we can study the impact of these factors on PATIENT-ATT.

4.4.3 The pretest and the internal consistency

The pretest was performed at one NGO hospital in the south of the West Bank. Patients found the length of the questionnaire appropriate. Additionally, the layout was well accepted and clear. They gave specific minor comments that were incorporated. These corresponded to the rewording of a few items. The time for completing the questionnaire was less than 10 minutes. Consequently, few modifications were made after piloting. Cronbach's alpha was calculated per the BSC perspective. All perspectives had a Cronbach's alpha above 0.7 at the

pretest, except for the environmental perspective, which was 0.59. Hence, some of its items were moved to other perspectives, and five items were deleted. As a result, 52 and 50 items remained for inpatients and outpatients, respectively.

Table 3. Characteristics and socio-demographics of respondents (patients)

Sociodemographic characteristic	Number of patients (N= 740)	%	Sociodemographic characteristic	Number of patients (N= 740)	%
Age (years)			Income (NIS)		
Less than 20	63	8.5	Less than 1000	195	26.4
20-29	209	28.2	1000-2000	98	13.2
30-39	208	28.1	2001-3000	152	20.5
40-49	159	21.5	3001-4000	140	18.9
50-59	71	9.6	More than 4000	155	20.9
60-69	24	3.2	Insurance type #		
More than 70	6	0.8	Public	492	66.5
Gender			Private	143	19.3
Females	325	43.9	UNRWA	63	8.5
Males	415	56.1	No insurance	109	14.7
Highest degree			Number of the current visit		
Elementary	85	11.5	First	227	30.7
Secondary	217	29.3	Second	187	25.3
Bachelor	366	49.5	Third	91	12.3
Masters	63	8.5	Fourth	54	7.3
PhD	9	1.2	Fifth	181	24.5
Working sector			Admission status		
Public	175	23.6	Inpatients	350	47.3
Private	183	24.7	Outpatients	390	52.7
Freelancer	156	21.1	The respondent opinion is based on #		
Retired	17	2.3	Personal experience	570	77
Unemployed	209	28.2	Family experience	306	41.4
			Friends experience	96	13

Note: NIS, New Israeli Shekel; UNRWA, The United Nations Relief and Works Agency for Palestine Refugees in the Near East; NGO, non-governmental organization; #, a multiple response question.

4.4.4 Linguistic validation and translation

The final English and Arabic questionnaire forms were ready for use.

4.4.5 Sample size and characteristics

Since the research coincided with the COVID-19 pandemic, hospital approvals took six to nine months until they were received. Only 15 hospitals out of 18 agreed to participate. The data collection was performed between January and October 2021. The data from the pretest

at one hospital were excluded. Next, we distributed 1000 questionnaires to the remaining 14 hospitals. As a result, 740 were returned (the response rate was 74%). The characteristics and socio-demographics of the respondents are shown in *Table 3* and *Table 4*.

Table 4. Number of patients and hospitals based on hospital characteristics

Characteristics	Number of	%	Number of	%
	patients (N= 740)		hospitals (N= 14)	
Administrative Type				
Public	252	34.1	5	36
NGO	277	37.4	5	36
private	159	21.5	3	21
UNRWA	52	7	1	7
City				
Hebron	150	20.3	3	21
Jerusalem	86	11.6	1	7
Nablus	249	33.6	5	36
Qalqilya	52	7	1	7
Ramallah	151	20.4	3	21
Tulkarm	52	7	1	7
Area				
North	353	47.7	7	50
Middle	237	32	4	29
South	150	20.3	3	21
Accredited hospital				
Yes	185	25	3	21
No	555	75	11	79
Size				
Small (No. Of beds <80)	241	32.6	5	36
Medium (No. Of beds 80-160)	261	35.3	5	36
Large (No. Of beds >160)	238	32.2	4	29

Note: UNRWA, The United Nations Relief and Works Agency for Palestine Refugees in the Near East; NGO, non-governmental organization.

4.4.6 Statistical analysis

The statistical analysis using the Shapiro–Wilk test showed that the data were not normally distributed, so nonparametric tests were used. Then, construct validation was assessed for the instrument.

4.4.6.1 EFA

EFA resulted in 46 items with loadings higher than 0.50 for 16 components. Eigenvalues for all components were higher than one. The KMO was 0.813, reflecting very high sampling adequacy [209,217], and Bartlett's test was also significant. The cumulative variance was 67.414% (**Table 5**). The 12 components were BSCP-ATTs, PATIENT-CENT-EXR, services experience (SERV-EXR), PR-EXR, building experience (BUIL-EXR), ACC-EXR, COMP-PI, technology perceived image (TECH-PI), information experience (INFO-EXR), HSRP-PI, and WT-EXR. One item (SAT2) loaded on the 12th component. However, this item had a higher loading on the BSCP-ATTs. None of the specific inpatient items had loadings higher than 0.50. Moreover, the scree plot showed the necessity of deleting the last three components.

4.4.6.2 CFA

The resulting nine components in EFA were tested in the Amos program. The model was edited based on the item loadings, model fit indices, and calculations in the convergent, discriminant, CR, IIC, and CITC at the next step until we arrived at the best model. First, adding two items that did not have loadings to the INFO-EXR construct showed good loadings in CFA. The same was true for the BSCP-ATTs and technology-perceived image (TECH-PI) constructs. Second, splitting the BUIL-EXR component into two separate constructs, BUILENV-EXR and BUILCAP-EXR, improved the item loadings and the model fit. Third, PEN9 and PLE7 items were removed from the PATIENT-CENT-EXR construct because they have loadings lower than 0.50. On the other hand, PIN 14 and PIN 16 were added to the BSCP-ATTs construct since both had loadings higher than 0.50 and improved the model fit. Moreover, merging the TECH-PI and COMP-PI items at the BSCP-ATTs construct resulted in loadings lower than 0.5 and IIC lower than 0.30. Hence, three separate constructs in the attitude section were decided. Finally, the modification indices in the Amos program were utilized to improve the model. The final model revealed that the CMIN/df, CFI, GFI, TLI, RMSEA, and SRMR indices in CFA were above or close to the cutoff points, reflecting a good fit model.

Table 5. EFA for BSC-PATIENT components

Component	Item	Item code	Component/item loadings											
			1	2	3	4	5	6	7	8	9	10	11	12
BSCP-ATTs	I will recommend this hospital to my family and friends.	SAT3	.894											
	I believe I receive an accurate medical examination at this hospital.	PIN1	.783											
	I will choose this hospital again when I need a medical consultation.	PEN2	.754											
	I believe this hospital offers me better treatment than the other Palestinian hospitals.	PEN3	.686											
	My overall satisfaction with this hospital's performance is high.	SAT1	.683											
	I believe this hospital has a high cure rate.	PEN1	.651											
	I will choose this hospital again when I need a medical consultation.	SAT2	.579											.556
	I believe the staff at this hospital are competent, knowledgeable, updated, and skilled.	PLE1	.537											
PATIENT-CENT-EXR	This hospital distributes surveys to assess my satisfaction before discharge.	PCU4		.968										
	This hospital distributes surveys to assess my needs upon arrival to the hospital, admission, or during the stay.	PCU3		.755										
	Separate male/female waiting areas are available at this hospital.	PEN9		.655										
	This hospital follows up with me after the discharge.	PLE11		.645										
	My complaints are taken seriously into consideration and solved immediately at this hospital.	PCU5		.601										
	I can book an online or a phone appointment at this hospital easily.	PLE7		.586										
	Staff trained me on infection precaution measures such as hand hygiene, cough etiquette, isolation rationale, personal protective equipment, etc.	PLE6		.560										

SERV-EXR	Female doctors are available at this hospital.	PEN8	.625
	There are a variety of departments at this hospital.	PIN12	.616
	Services at night, on vacations, and weekends are available at this hospital.	PIN18	.556
	There are a variety of specialties at this hospital.	PIN15	.540
PR-EXR	I pay a reasonable price for the other medical services (laboratory, radiology, etc.) at this hospital.	PFI2	.959
	I pay a reasonable price for the medications at this hospital.	PFI3	.888
	I pay a reasonable price for medical consultations at this hospital.	PFI1	.848
BUIL-EXR	There is a sufficient number of chairs in the waiting area.	PEN13	.639
	The hospital has clean departments, corridors, rooms, and bathrooms.	PEN12	.585
	The capacity of departments at this hospital including (ER, ICU, waiting room, etc.) is sufficient enough.	PEN14	.562
	This hospital has a new building infrastructure (walls, ceilings, bathrooms, etc.).	PEN11	.519
ACC-EXR	The accessibility to this hospital is easy by either public transportation or my car.	PEN4	.910
	The accessibility to this hospital in an emergency is easy.	PEN5	.907
COMP-PI	Postoperative bacterial infection is probable at this hospital	PIN6	.765
	There is a probability of case referral to another hospital	PIN5	.752
	There is a probability of case readmission at the same hospital	PIN4	.602
TECH-PI	This hospital use technology to link my prescriptions and tests with the pharmacy and labs.	PLE9	.842
	This hospital use technology for saving my records.	PLE10	.564
INFO-EXR	The information provided to me to be used after discharge is sufficient (medication and side effects, health condition, etc.).	PLE4	.708

HSRP-PI	I believe this hospital offers social and volunteering activities to the community.	PEN7												.601
	I believe this hospital offers exemptions for poor patients.	PEN6												.566
WT-EXR	I wait for a long time before receiving the medical service at this hospital.	PIN9												.556
Percentage of Variance (%)			27.46	5.81	5.02	3.71	3.40	3.24	2.79	2.70	2.48	2.37	2.22	2.09
Total variance = 63.29%														
Eigenvalues			14.28	3.02	2.61	1.93	1.78	1.69	1.45	1.40	1.29	1.23	1.16	1.10

Note: EFA, exploratory factor analysis; BSCP-ATTs, patient attitudes toward balanced scorecard perspectives; PATIENT-CENT-EXR, patient-centeredness care experience; SERV-EXR, services experience; PR-EXR, price experience; BUIL-EXR, building experience; ACC-EXR, hospital accessibility experience; COMP-PI, complications perceived image; TECH-PI, technology perceived image; INFO-EXR, information experience; HSRP-PI, hospital social responsibility perceived image; WT-EXR, waiting time experience;

Nevertheless, the P value was <0.001 , which can be referred to as its sensitivity to normality. See the CFA results in **Figure 14** and **Table 6**. For the items which did not load in EFA, the items which were tested in CFA, and the final resulting items, refer to **Appendix A8**.

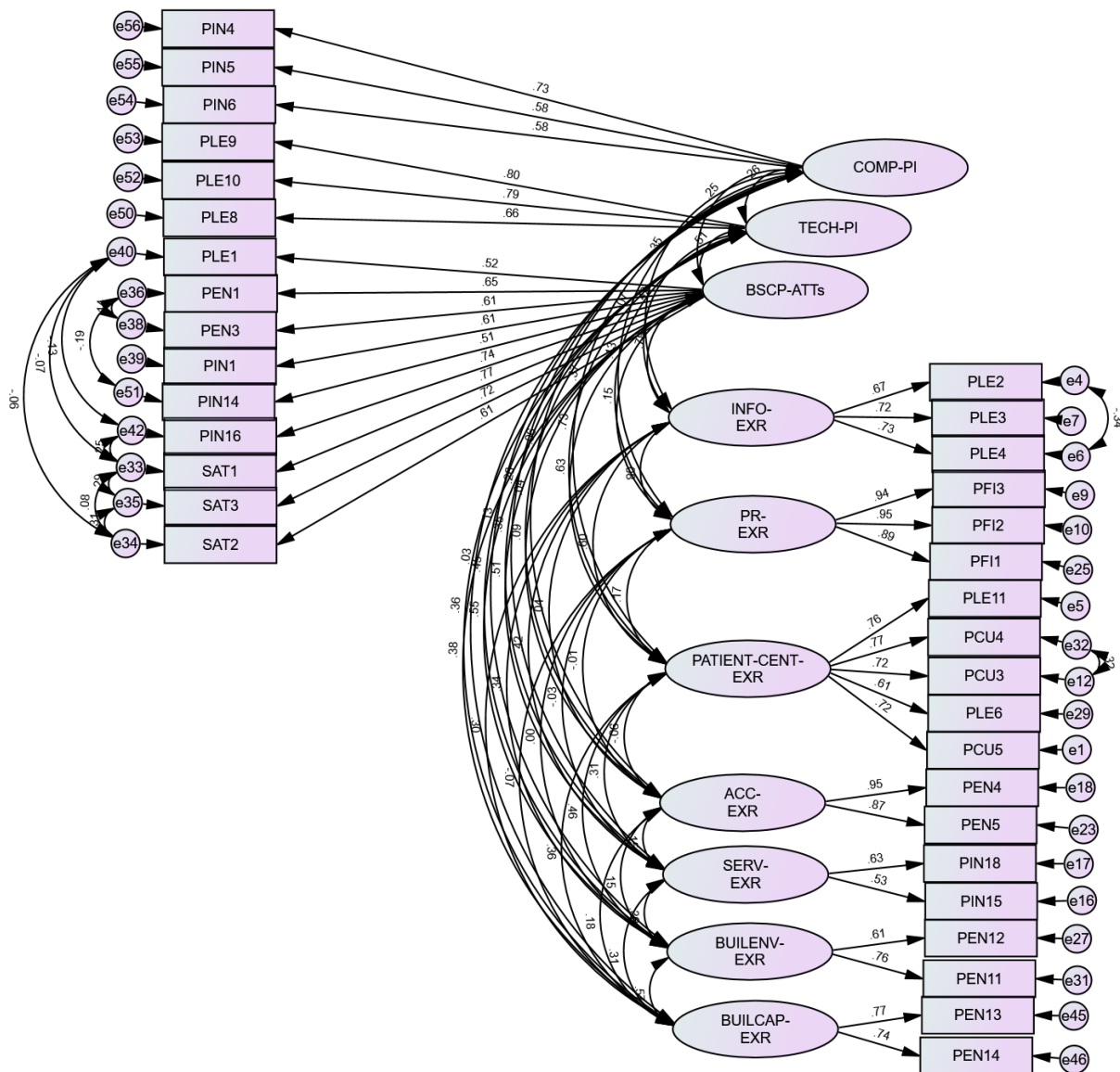


Figure 14. CFA model for BSC-PATIENT constructs.

(Source: Own elaboration). Note: Independent items on the right side and dependent items on the left side; CFA, confirmatory factor analysis; COMP-PI, complications perceived image; TECH-PI, technology perceived image; BSCP-ATTs, patient attitudes toward balanced scorecard perspectives; INFO-EXR, information experience; PR-EXR, price experience; PATIENT-CENT-EXR, patient-centeredness care experience; ACC-EXR, hospital accessibility experience; SERV-EXR, services experience; BUILENV-EXR, building environment experience; BUILCAP-EXR, building capacity experience.

Table 6. The goodness of fit indices in EFA and CFA and results

EFA [203,210]		CFA [224]	
Criteria for good fit [209,217]	Measurements	Criteria for good fit	Measurements
- KMO: 0.6: low adequacy 0.7: medium adequacy 0.8: high adequacy 0.9: very high adequacy - Bartlett's test <i>P value</i> < 0.05 - Inclusion/exclusion criteria for the components: 1- Eigenvalues \geq one 2- Visual assessment of Cattell's scree plot. -Inclusion/exclusion criteria for the items: 1- The factor loading \geq 0.50. 2- Factor loadings on the assigned factor \geq all cross-loading of other factors.	- KMO = 0.901 (Chi-square = 9052.693, degrees of freedom = 1326) -Bartlett's test <i>P value</i> < 0.001 - 12 components that have Eigenvalues higher than one - Cumulative variance = 63.29%	- χ^2/df < five and closer to zero - The <i>P value</i> > 0.05 - GFI - CFI - TLI GFI, CFI, and TLI close to 0.95 - RMSEA < 0.06 - SRMR \leq 0.08	χ^2/df = 1.58 <i>P value</i> < 0.001 GFI = 0.901 CFI = 0.953 TLI = 0.944 RMSEA = 0.039 SRMR = 0.0439 -10 constructs

Note: EFA, Exploratory Factor Analysis; CFA, Confirmatory Factor Analysis; KMO, Kaiser–Meyer–Olkin; χ^2/df , minimum discrepancy divided by its degrees of freedom; GFI, goodness-of-fit index; CFI, comparative fit index; TLI, Tucker–Lewis's index; RMSEA, root mean square error of approximation; SRMR, standardized root mean square residual.

Table 7. Factors' IIC, CTIC, and CR

Factor	IIC (Min.-Max.)	CTIC (Min.-Max.)	CR	N of Items (Total = 34)
COMP-PI	0.395-0.411	0.474-0.486	0.664	3
TECH-PI	0.390-0.594	0.486-0.642	0.794	3
BSCP-ATTs	0.328-0.641	0.505-0.735	0.861	9
INFO-EXR	0.389-0.531	0.501-0.609	0.750	3
PR-EXR	0.509-0.725 ^{>>}	0.596-0.760 ^{>>}	0.948	3
PATIENT-CENT-EXR	0.413-0.678	0.552-0.736	0.841	5
ACC-EXR	0.853	0.853	0.906	2
SERV-EXR	0.360	0.360	0.502	2
BUILENV-EXR	0.412	0.412	0.643	2
BUILCAP-EXR	0.527	0.527	0.721	2

Note: COMP-PI, complications perceived image; TECH-PI, technology perceived image; BSCP-ATTs, patient attitudes toward balanced scorecard perspectives; INFO-EXR, information experience; PR-EXR, price experience; PATIENT-CENT-EXR, patient-centeredness care experience; ACC-EXR, hospital accessibility experience; SERV-EXR, services experience; BUILENV-EXR, building environment experience; BUILCAP-EXR, building capacity experience; IIC, Interitem correlation; CTIC, corrected item-total correlation; CR, composite reliability; ^{>>}, was calculated only for patients who pay at the evaluated hospitals.

4.4.6.3 CR and IICs

The CRs for all factors were higher than 0.6 except for the SERV-EXR factor. However, this factor's IIC and CTIC were higher than 0.3. The other factors also had IICs higher than 0.3, and their CITC ranged from 0.328-0.853, reflecting satisfactory IIC and CITC (*Table 7*).

4.4.6.4 Convergent and divergent/discriminant validity

The convergent validity was less than 0.5 for BSCP-ATT, BUILENV-EXR, SERV-EXR, and COMP-PI. However, the CR, IIC, and CITC showed satisfactory results [219], except for the SERV-EXR, which had a CR equal to 0.50 but an IIC and CITC higher than 0.3. On the other hand, the square roots of the AVE were higher than the off-diagonal correlations between factors. Additionally, a lower correlation between factors indicates each factor's uniqueness. The correlations between the independent factors were either negligible or low, except between two factors, the PATIENT-CENT-EXR and INFO-EXR, which were moderate. Merging the two constructs lowered the loadings and the model fit indices in CFA.

Table 8. Convergent, and discriminant/divergent validity for the independent factors (PATIENT-EXR)

Factor	AVE	INFO-EXR	PR-EXR	PATIENT-CENT-EXR	ACC-EXR	SERV-EXR	BUILENV-EXR	BUILCAP-EXR
INFO-EXR	0.501	0.708						
PR-EXR	0.858	<i>0.084*</i>	0.926					
PATIENT-CENT-EXR	0.515	<i>0.507**</i>	<i>0.095*</i>	0.718				
ACC-EXR	0.828	<i>0.121**</i>	<i>-0.005</i>	<i>0.053</i>	0.910			
SERV-EXR	0.337	<i>0.341**</i>	<i>0.002</i>	<i>0.242**</i>	<i>0.164**</i>	0.581		
BUILENV-EXR	0.477	<i>0.302**</i>	<i>-0.006</i>	<i>0.336**</i>	<i>0.110**</i>	<i>0.209**</i>	0.691	
BUILCAP-EXR	0.564	<i>0.288**</i>	<i>0.016</i>	<i>0.366**</i>	<i>0.164**</i>	<i>0.238**</i>	<i>0.394**</i>	0.751

Note: PATIENT-EXR, patient experiences; PATIENT-CENT-EXR, patient-centeredness care experience; INFO-EXR, information experience; PR-EXR, price experience; ACC-EXR, hospital accessibility experience; BUILCAP-EXR, building capacity experience; SERV-EXR, services; BUILENV-EXR, building environment experience; AVE, average variance extracted calculated by the average square of loadings at each factor and used to evaluate the convergent validity; **Bold**, square roots of the average variance extracted; *Italic*, Spearman correlations between independent factors, both are used to evaluate discriminant validity; *, $P < 0.05$; **, $P < 0.01$.

Table 9. Convergent, and discriminant/divergent validity for the dependent factors (PATIENT-ATTs)

Factor	AVE	BSCP-ATTs	TECH-PI	COMP-PI
BSCP-ATTs	0.413	0.643		
TECH-PI	0.564	<i>0.397**</i>	0.751	
COMP-PI	0.400	<i>0.216**</i>	<i>0.156**</i>	0.633

Note: PATIENT-ATTs, patient attitudes; COMP-PI, complications perceived image; TECH-PI, technology perceived image; BSCP-ATTs, patient attitudes toward balanced scorecard perspectives; AVE, average variance extracted calculated by the average square of loadings at each factor and used to evaluate the convergent validity; **Bold**, square roots of the average variance extracted; *Italic*, Spearman correlations between independent factors, both are used to evaluate discriminant validity; **, $P < 0.01$.

The same was perceived regarding merging the BUILENV-EXR and BUILCAP-EXR constructs. Consequently, separate factors were determined, as mentioned earlier. Regarding the independent factors, negligible or low correlations existed among them. Neither high nor very high correlations existed between the independent factors. Therefore, this establishes discriminant validity and the uniqueness of the independent factors. The same holds for the dependent factors. In other words, convergent validity was met for all factors except SERV-EXR. In comparison, discriminant validity was met for all factors, as shown in *Table 8* and *Table 9*.

4.5 Discussion

4.5.1 Discussion of the main results

In agreement with this paper's aim, it was possible to build a valid and reliable instrument. BSC-PATIENT is the first validated instrument to engage patients in the evaluation of hospitals by measuring their experiences and attitudes toward the hospital based on the BSC perspectives: the financial, internal, knowledge and growth, customer, and external perspectives. The deployment of this instrument at BSC implementations and PEs, in general, will improve patient satisfaction and allow a better understanding of BSC strategic maps based on patients' experiences and attitudes.

Our findings showed that PATIENT-ATTs toward all BSC perspectives and dimensions loaded on one construct, except the TECH-PI and COMP-PI, loaded separately. The instrument was customized to be compatible with Palestinian hospitals. Statistics revealed that out-of-pocket household payments constituted 39.8% of the Palestinian territories' total healthcare expenditures in 2018 [225]. This number is close to the results in our sample, which showed that 14.73% of patients did not have any insurance, and 19.32% had private insurance. Additionally, our analysis shows that another 35.41% or 1.49% of our sample had public or UNRWA insurance, respectively, but was receiving treatment at an NGO or private hospital at the time of the study. This situation indicates that the patients either made out-of-pocket payments or that the government paid a medical referral to private or NGO hospitals [63]. Therefore, incorporating the financial perspective consideration in this paper proved to be vital. Additionally, many BSC implementations in Afghanistan and Bangladesh revealed the need to consider the social and cultural perspective in evaluation, specifically female attentiveness concerns [79,105,106,111,114]. The authors believed that this was also the case in Palestine, so the BSC-PATIENT included such items. However, in different cultures, this may not be important. Hence, these items can be removed or replaced with other customized environment-

related items. Finally, the TECH systems vary among Palestinian hospitals. Although PMOH hospitals and many other private hospitals have adopted the health medical information system for years, some hospitals still use the manual system for documentation. The authors also considered this perspective important in this evaluation.

The causal relationships between BSC dimensions that were described in BSC strategic maps may impose a challenge on producing a good fit model, specifically discriminant validity. Despite this challenge, our model proved satisfactory construct, convergent, and discriminant validity. The CR was higher than 0.6 for all factors except the SERV-EXR factor. This may indicate that a separate evaluation for this factor item is needed. Moreover, the IIC and the CITC were satisfactory. In general, this questionnaire proved reliable and valid for engaging patients in hospital evaluations by measuring their experiences and attitudes toward Palestinian hospitals.

4.5.2 Comparison with BSC implementations

The review of the dimensions utilized in BSC implementations [26] revealed that 77 percent of the implementations did not engage patients at any point in the assessment process. Instead, they relied only on hospital records and reports to evaluate the BSC perspectives. Patients were included in the remaining 22% of BSC implementations [79–81,93,105,107,108,111] to analyze only the patient satisfaction perspective. Although 11% of BSC implementations [106,108,111] included community members in the BSC perspective evaluation, none of the BSC implementations engaged patients in this process. In addition, patient interviews were utilized in each of the 22 percent of BSC deployments, but patient surveys were never used. This highlights both the significance of the BSC-PATIENT development and the originality of the study being conducted.

4.5.3 Comparison with other validated instruments

4.5.3.1 Service quality scale (SERVQUAL)

One of the most popular models to measure service quality is the 44-question SERVQUAL instrument [226]. However, SERVQUAL has been criticized for encountering various shortcomings [227,228]. First, numerous studies have questioned whether SERVQUAL is applicable as a generic scale for measuring service quality in all settings [227], as it was not initially designed for hospitals. In contrast, BSC-PATIENT was explicitly designed for hospitals. Second, the concept of “subtraction” in the SERVQUAL model is not

equivalent to psychological function [227]. However, the BSC-PATIENT was designed to be coherent with psychological definitions by distinguishing between experience observations and attitudes. Third, researchers uncovered some shortcomings of the discriminant validity at SERVQUAL [227]. They explained that reliability, responsiveness, assurance, and empathy dimensions were not distinct from each other and were loaded into one factor in many studies due to the high degree of intercorrelation [227]. All BSC-PATIENT factors passed discriminant validity. Fourth, SERVQUAL has been criticized for focusing on functional quality, not REPUT quality [228]. This challenge was overcome in BSC-PATIENT through the separation of observations and attitudes.

4.5.3.2. Press Ganey

Another commonly used instrument is Press Ganey [229], a 21-question instrument explicitly developed to measure hospital patient experience. However, Press Ganey also has a few shortcomings. Many studies using this instrument reported evidence of nonresponse bias [195,196]. The response rate for BSC-PATIENT was 74% despite the COVID-19 situation. Many patients commented that the questionnaire was interesting to complete. This can also be referred to as the simplicity of the three-point scale, unlike the five- and seven-point Likert scales, which can contribute to greater respondent burden and fatigue and may lead to higher refusal rates [223]. Finally, BUIL-EXR, SERV-EXR, TECH, PR-EXR, and PATIENT-ATTs items were not considered necessary in Press Ganey.

4.5.3.3 Hospital consumer assessment of healthcare providers and systems (HCAHPS)

The 29-question HCAHPS [230] is widely used in the United States of America to evaluate PATIENT-EXR. It incorporates eight dimensions. However, the response rate for this instrument was found to be low [197,198]. Additionally, the ACC-EXR, PR-EXR, and TECH-PI were neglected. Moreover, the HCAHPS allows researchers to evaluate the overall patient satisfaction rate based on their subratings for different experience factors, such as RESCOMINF [165,197,198]. Although experience perceptions can predict PATIENT-ATTs, including satisfaction, a separate evaluation of experiences and satisfaction was recommended [223]. This point was taken into account when designing the BSC-PATIENT.

4.5.4 Strengths and limitations

In general, this study has several strengths. First, the BSC-PATIENT is the first instrument that engages patients in BSC perspective assessment. Second, this instrument can

determine PATIENT-ATTs based on BSC perspectives. Third, to our knowledge, this is the first study to distinguish between PATIENT-EXR and PATIENT-ATTs, which will allow us to examine the relationship between PATIENT-EXR and PATIENT-ATTs in future studies. Fourth, this instrument was customized to be used for all insurance, leadership, and admission statuses. Fifth, this instrument was designed based on KPIs extracted from BSC implementations in primary, secondary, and tertiary healthcare settings in low-, middle-, and high-income countries worldwide. Hence, the implementation of BSC-PATIENT can be generalized to different healthcare settings and countries. However, the instrument may need some customization based on the healthcare setting strategy and the country's properties. For example, we customized the BSC-PATIENT from the environmental perspective based on Palestinian culture, the financial perspective based on administrative type, the knowledge and growth perspective based on the health information system in Palestine, and a few items specific for inpatients based on admission status. Finally, no study has assessed Palestinian hospital performance during this era, so using BSC-PATIENT will offer a comprehensive hospital assessment from patient perspectives during COVID-19. However, this instrument has some limitations. Despite this instrument assessing items such as patient education on IC, it lacks COVID-19-specific items, as this instrument was designed before the COVID pandemic, so COVID-19-related items can be considered in future versions of the BSC-PATIENT instrument. Second, patient literacy was not assessed. However, the academic qualifications were evaluated at the demographic level to be considered in the analysis. Third, measuring PATIENT-EXR in the past may involve a bias of recall. Additionally, participant bias may have occurred since the sample was convenient and the included hospitals agreed on participation. However, the high percentage of the included hospitals (30%) from the total number of hospitals at West Bank and including all administrative type types from all regions may have reduced the selection bias. Another limitation is that we could not validate this instrument in English due to our inaccessibility to English-speaking patients. Future research needs to consider testing the psychometric properties of the BSC-PATIENT in an English-speaking country.

4.5.5 Practical implications

Researchers and HCO managers are advised to utilize the BSC-PATIENT instrument in future BSC implementations. First, HCO managers will be able to highlight the strengths and weaknesses in BSC dimensions based on patients' perspectives. Second, analysis of the BSC strategic maps based on patients will allow managers to highlight the predictors of patient

LOY-ATTs. Third, HCO managers will be able to distinguish between patients' actual experiences and their attitudes. Analyzing the causal relationships between experiences and attitudes will provide insight for managers into which experiences should be improved to enhance PATIENT-ATTs. This will also guide managers in building their future action plans and how to allocate resources. Fourth, BSC-PATIENT can be utilized in the PE of HCO in general to evaluate a variety of dimensions instead of focusing only on patient satisfaction. The comprehensive analysis provided by this instrument will contribute to the health management field in general and will enhance patient satisfaction.

4.6. Conclusion

The BSC-PATIENT instrument was developed to enhance PATIENT-ENG in the PE of hospitals. This instrument was validated in Arabic and customized for Palestinian hospitals. This is the first instrument to engage patients in evaluating their experiences and attitudes toward the BSC perspective. It consists of 38 items: 21 items assessing patient experience observations and 15 items assessing PATIENT-ATTs. Both experiences and attitudes were designed based on BSC perspectives. The findings of this research showed adequacy in the psychometric properties of this instrument and suggest some recommendations for future research. First, we tested the psychometric properties of the BSC-PATIENT in English and other languages in different countries. Second, we consider it vital to engage other stakeholders, such as doctors, nurses, and managers, in the PE of hospitals' BSC perspectives. Third, this instrument can be used to assess the impact of PATIENT-EXR on PATIENT-ATTs toward the hospital, specifically the PI, PQ, satisfaction, and LOY-ATTs. Fourth, managers must consider using a comprehensive approach for the PE of hospitals instead of limiting it to financial or internal indicators. Fifth, BSC-PATIENT will allow comparing the differences in patient experience and attitudes based on patient and hospital characteristics. Finally, enhancing PATIENT-ENG in the evaluation process instead of focusing on satisfaction alone must be considered in future BSC and PE implementations. Involving stakeholders in the comprehensive evaluation of the BSC will lead to a better and deeper understanding of hospital PE.

Chapter 5: Engaging HCWs in BSC implementations

(Sub-study 4): How to engage HCWs in the evaluation of hospitals: development and validation of BSC-HCW1 - a cross-sectional study⁴

5.1 Introduction

Up to the beginning of 2022, there were only two reviews investigating the effect of implementing the BSC in healthcare. One of these studies conducted a qualitative analysis of the positive impact [38], while the other gave a few examples of the beneficial effects [1]. This indicated a need to perform a robust scientific approach to determine whether BSC adoption in HCOs is beneficial.

Due to a dearth of research, we performed a systematic review to analyze the effect of applying the BSC on three attributes: HCWs' satisfaction, patient satisfaction, and financial performance [1,2]. As a consequence, BSC deployment has been shown to enhance HCOs' financial performance [25]. Furthermore, BSC proved to be effective in increasing patient satisfaction. However, it did not prove effective in enhancing the satisfaction rate of HCWs [25]. This was due to many reasons. First, the analysis of the BSC implementations in our two previous systematic reviews [25,26] revealed that most of the implementations focused on measuring HCWs' satisfaction as a sole indicator. Second, although strategic maps were utilized based on hospital record data in BSC implementations, there has been a lack of analysis of the factors that impact or predict HCWs' satisfaction based on HCWs' opinions and observations [25]. Third, although the researchers have pointed to the importance of patient and HCW-ENG in the process of PE and delivery improvement [31–33], the reviews [26,30] revealed that there had been a lack of engaging stakeholders in BSC implementations, such as engaging patients and HCWs. Based on the review [25], we recommend that HCW-ENG in BSC implementations might provide a solution to the issue of stagnant levels of satisfaction among HCWs in BSC implementations. In addition, the participation of HCWs will aid HCO managers and researchers in their efforts to obtain a better

⁴ This chapter is based on the following paper: **Amer F.**, Hammoud S., Khatatbeh H., Alfatafta H., Alkaiyat A., Nour A.I., Endrei D. Boncz, I. (2022). How to Engage Health Care Workers in the Evaluation of Hospitals: Development and Validation of BSC-HCW1—A Cross-Sectional Study. *International Journal of Environmental Research and Public Health*. 19, 9096. <https://doi.org/10.3390/ijerph19159096>. **Impact factor: 4.614**

grasp of the BSC strategic maps as well as the causal relationships between KPIs based on the perspectives of HCWs. Moreover, we think that the participation of HCWs in BSC implementations will result in an even greater improvement in both the financial performance and the level of satisfaction perceived by patients.

In our second systematic review of the BSC, we identified the perspectives and dimensions that were the most important and most frequently used in BSC implementations in the healthcare sector. This review resulted in a total of 797 KPIs, which were divided and categorized into 45 subdimensions for this analysis. Following the reassembly of these subdimensions, 13 main dimensions emerged. We found that the environmental and management perspectives are also essential to consider when designing BSCs.

Figure 11 represents a summary of the perspectives, major dimensions, and subdimensions that were more frequently used and deemed essential by healthcare managers worldwide. We also found that in a manner similar to the inadequate emphasis placed on HCWs' satisfaction during BSC implementations in HCOs, the notion LOY-ATT of HCWs was rarely taken into consideration. [25,26]. A review in the business field [231] found a strong positive relationship between satisfaction and LOY-ATT. However, these relationships were found to be moderated by different factors, such as demographics and setting type. We think that understanding HCWs' LOY-ATTs may assist hospital managers in expecting HCWs' future behavior. This will provide insight to managers when evaluating their hospitals' performance, building their plans, and allocating their resources.

In this research, the first aim is to develop an instrument that performs HCW-ENG in a comprehensive assessment of BSC perspectives and dimensions (BSC-HCW1). The second aim of this research is to customize the developed instrument at Palestinian hospitals, translate it into Arabic, and validate it.

5.2 The conceptual framework

The dimensions and KPIs that emerged from our BSC systematic review [26] served as the basis for our conceptual model development. Because of the large number of KPIs, we narrowed our focus to those that are directly related to the demands of HCWs from each BSC perspective. In tandem with reviewing 34 studies in the literature [26,124,235–244,181,245–254,182,255–257,184,222,231–234], we separately examine 77 causal linkages between each BSC dimension or KPIs and HCWs' satisfaction and LOY-ATT, as explained in the perspectives below. We made this choice since HCWs' satisfaction was deemed one of the most recently affected perspectives in strategic maps [2]. After that, we merged all the causal relationships into a single strategic map, which is shown in *Figure 15*.

5.2.1 Managerial perspective

The role of healthcare management in improving HCWs' satisfaction and LOY-ATT has been discussed in many studies [232]. Executives' appreciation and recognition of HCWs' efforts result in higher HCWs' satisfaction rates [233,234]. Other studies found that executives who have better MANAG-COMM and relationships with HCWs can better understand their needs and unfavorable working conditions. Consequently, this creates favorable working conditions [234,235]. Supervision is also critical to clarify job tasks and objectives and to cope with stress support [236,237]. A lack of roles and ambiguity increased HCWs' dissatisfaction and lowered productivity and efficiency [238]. Additionally, a review found that most of the variance in intention to stay referred to managers respecting HCWs' opinions [239]. The better managers perform, the more HCW-ENG is also linked with higher doctor satisfaction [232].

5.2.2 Financial perspective

Many studies have referred to compensation and motivations, including rewards and FINI, as other essential predictors. For example, many reviews [233,239,240] revealed that satisfaction with payment contributed to the greatest variance in job satisfaction. Financial compensation includes salary, incentives, and benefits packages [232,241]. Access to resources was also found to have a positive impact on doctors' satisfaction [232].

5.2.3 Knowledge and growth perspective

The TECH major dimension is usually part of the knowledge and growth perspective in the BSC. However, previous studies revealed the need to evaluate them separately [26,242]. The effect of the TECH system on HCWs' satisfaction was assessed in this context [241]. It was found that an electronic decision support system could improve the work motivation of HCWs [237].

The information and innovation major dimension assesses HCWs' KAP, as well as the training materials and HCWs' accessibility to them [237,241]. A study found that on-the-job training motivated 99.0% of HCWs [243]. This perspective also measures professional HCWs' SCIDEV, such as promotion in their career [233,240]. Opportunities for professional development, being a chief, and prior achievement were found to have a positive impact on doctors' satisfaction [232].

5.2.4 Internal process perspective

This perspective contains the evaluation of job security [238]. Strategies to improve safety in the work environment could improve job satisfaction [235,241]. On the other hand,

the lack of equipment or medication [237,244], such as the nonavailability of personal protective equipment during the pandemic, increased dissatisfaction [245]. Moreover, a high workload and HCW shortage negatively influenced HCWs' job satisfaction [232,237,241,244].

5.2.5 External perspective

During the last two decades, both the social and environmental dimensions of sustainability have been gaining increasing attention among different stakeholder groups [125,246]. Social factors such as the REPUT, patient respect toward healthcare workers (PTR), and appreciation [241], as well as the social status of the job [238] and organizational prestige [238], were found to increase HCWs' job satisfaction. Moreover, family support was found to reduce burnout levels among HCWs [247], which in turn increases HCWs' satisfaction. On the other hand, other environmental factors, such as BUIL-EXR and infrastructure, lighting, noise, and space, affected HCWs' ability to work and consequently their satisfaction [237,238,241]. However, there is still limited research on the effect of these factors on HCWs' LOY-ATT.

5.2.6 Customer perspective

Positive relationships and improved communication among staff and solidarity and teamwork among them improve their job satisfaction [232,235,241]. Moreover, a better workload time-life balance (WTLB) also positively affects HCWs' job satisfaction [248]. On the other hand, emotional exhaustion is considered a symptom of HCWs' burnout [249], and burnout is a predictor of job dissatisfaction [250].

HCWs' satisfaction is vital in the hospital quality process [234]. In the same vein, researchers highlighted that a job satisfaction survey should include key contextual factors affecting it [251]. On the other hand, a loyal attitude is a behavioral intention that reflects faithfulness to something [182]. HCWs' satisfaction can predict LOY-ATT, such as preference against competitors, recommendation willingness, and intention to stay or leave [183,252]. Intent to stay or leave was evaluated in studies that cannot measure turnover directly [232,253]. This is considered necessary since a lower turnover leads to lower recruitment and training costs, increased retention of valuable employees, and increased organizational commitment and LOY-ATT [254,255]. Additionally, a study [255] revealed a negative relationship between job satisfaction and the intention of nurses to quit their current hospital. In previous studies, validated items for LOY-ATTs measurement included satisfaction, recommendation, and return intentions [183,185,242].

Work pride was a predictor of healthy working conditions [256]. We believe that work pride may affect HCWs' satisfaction and LOY-ATT; however, this has not been assessed in the literature. Using a single item to assess actual patient satisfaction directly was suggested to be better than its assessment through multidimensional items [223,257,258].

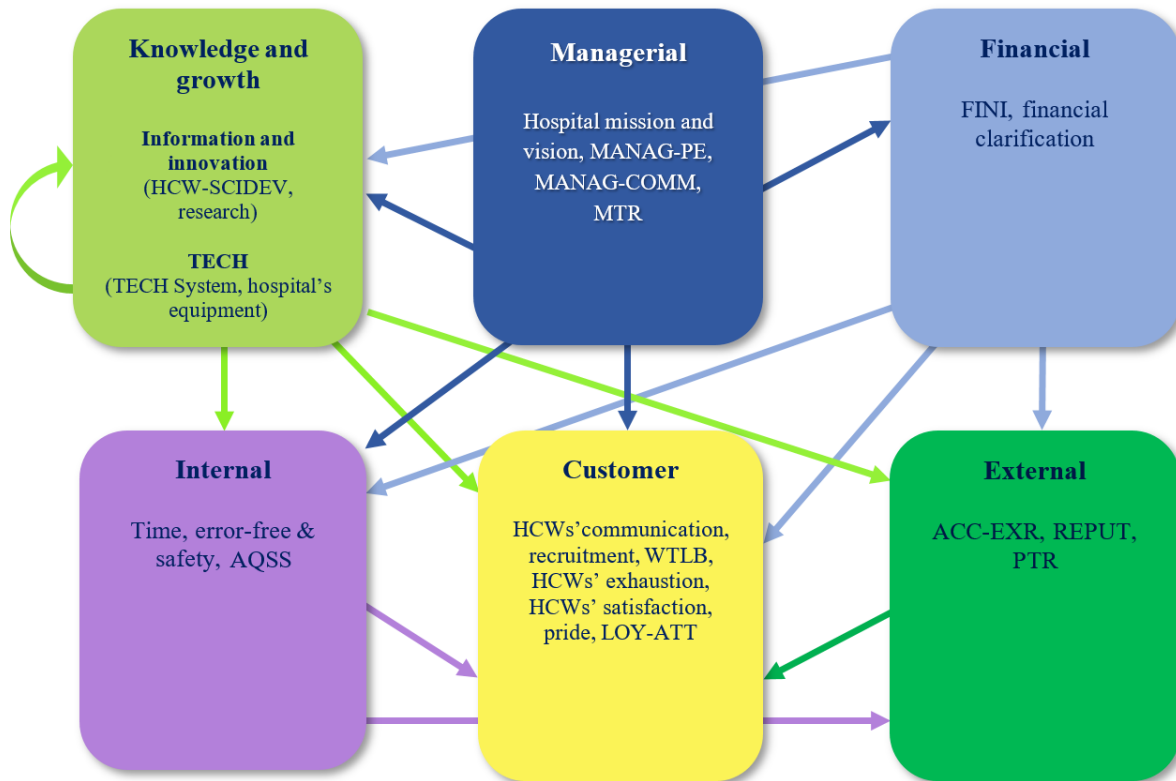


Figure 15. The conceptual model for the strategic map of the BSC-HCW1.

(Source: Own elaboration). Note: ACC-EXR, hospital accessibility experience; FINI, financial incentives; HCW, healthcare worker; HCW-SCIDEV, healthcare workers' scientific development; LOY-ATT, loyalty attitude; MANAG-PE, managerial tasks, and performance evaluation; MANAG-COMM, managerial communication; MTR, managerial trust; PTR, patient respect toward healthcare workers; REPUT, community, and reputation; TECH, technology; WTLB, workload time-life balance; AQSS, availability and quality and services and supplies.

5.2.8 Sociodemographic factors

In addition to the previously mentioned BSC perspectives, sociodemographic factors also impacted HCWs' job satisfaction. Sociodemographic factors related to HCWs can be HCWs' age [232], gender [232], profession type [244], specialty [232], marital status [232,244], years of work [232,240], and educational level [240]. Years of work were negatively associated with job satisfaction [240]. Additionally, educational level was found to have an inverse relationship with job satisfaction [240]. However, another study found that bachelor's holders had higher job satisfaction than diploma holders [255], which could have been referred to as the increased workload among diploma holders. On the other hand, organizational characteristics were also found to affect job satisfaction [259]. Additionally, it was found that

hospital type and structure have a significant impact on physician satisfaction [232]. Administrative types can affect the hospital's strategy, including its mission and vision, which may affect the performance of the BSC perspectives. However, the effect of hospitals' administrative types on the previously mentioned factors has yet to be studied.

5.3 Methods

5.3.1 Research design

This study is part of a broad project to use the BSC to strategically improve Palestinian hospitals through the analysis of their weaknesses and strengths based on the BSC perspectives. This research is a cross-sectional study reported using the STROBE guidelines [189]. The questionnaire was developed using Kaplan and Norton's theoretical framework [20,26], and it was validated using the best methods for constructing and validating the health and behavioral scales [190].

5.3.2 Item and scale generation

BSC-HCW1 was developed using the previously reported technique for BSC-PATIENT development [242] with HCW adaptation. The items of this instrument were created based on the contributions of two expert committees. In this study, the first panel comprises five panelists who are the authors of this research. Two health management researchers, two hospital managers who are also health management specialists, and one BSC tool expert offered expert advice at all phases of instrument development. First, we used the major subdimensions from our previous systematic review [26]. KPI extraction, classification, and regrouping yielded those dimensions [26]. This group then used a five-round Delphi technique [191]. The first panel examined the item face validity [192] per subdimension. Second, members of the second panel, consisting of 13 senior hospital executives from four Palestinian hospitals, were asked to assess the importance of 45 subdimensions to the strategic development of hospitals on a 10-point semantic scale. In addition, hospital executives were invited to indicate any additional important subdimension or KPI that was not included on the list. The characteristics and sociodemographics of this panel were described in a previous study [242]. For the following stage, we identified the important subdimensions. We specified an average score of seven as a threshold. These efforts were made in tandem with the creation of BSC-PATIENT [242].

In the third round, the first panel looked through the subdimensions created in the previous stage and determined which were connected to HCWs' needs from each perspective.

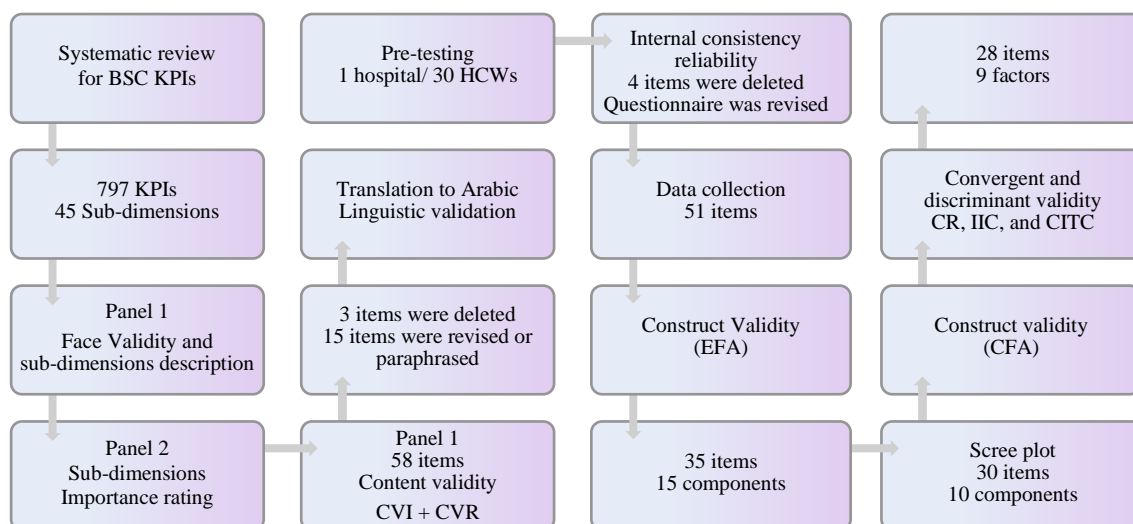


Figure 16. Flow chart of the development and validation of the BSC-HCW1 instrument. (Source: Own elaboration). Note: BSC, balanced scorecard; KPI, key performance indicators; CVI, content validity index; CVR, content validity ratio; EFA, exploratory factor analysis; CFA, confirmatory factor analysis; CR, composite reliability; IIC, interitem correlation; CITC, corrected item-total correlation.

As a result, there were 26 subdimensions. In the fourth round, the first panel developed items based on the critical subdimensions for hospital strategic development and literature-based predictors of HCWs' satisfaction and LOY-ATT. The panelists revised the wording and clarity per question in the fifth round. As a consequence, 58 items remained. The second panel employed four- and three-point ordinal scales to score the relevance of each item [193]. We calculated the I-CVI, the S-CVI, and the CVI-UA [193] to examine the content validity per item and scale. Items with a score of less than 0.60 were removed from the CVI. The items with a score of 0.6-0.8 were re-evaluated [193] (*Figure 16*).

The panelists chose a three-point Likert scale: yes, neutral (I do not know), and no. Reasons for that were the high number of the remaining items, evidence of a faster and higher response rate on a three-point Likert scale than a five-point Likert scale [195], and the opportunity to check item availability through yes/no questions contributed to this decision. Furthermore, this scale was deemed more appropriate due to the pandemic's impact on hospitals and HCWs [69,260,261]. Finally, all authors were requested to review the instrument, and the necessary changes were made.

5.3.3 Linguistic validation and translation

The same methodology used for the linguistic validation of BSC-PATIENT was also used for BSC-HCW1.

5.3.4 Pretest and internal consistency

Internal consistencies of the instrument's perspectives in the initial edition of the questionnaire were evaluated. The first version of the questionnaire was pretested on 30 HCWs in one NGO hospital in the south of the West Bank. We asked them for their opinion on the language's simplicity. We also kept track of how long it took them to complete the questionnaire. Items were assigned codes. Afterward, Cronbach's alpha [200] was calculated using IBM SPSS statistics 21 software. Values greater than 0.6 were deemed appropriate for each perspective. As a consequence, few elements were changed or removed.

5.3.5 Sampling procedure and power calculation

Since this is a part of broad research, the same sampling procedure and HCO sample used to produce BSC-PATIENT [242] was also used to develop BSC-HCW1. Between June and December 2020, requests were sent to 15 hospitals on the West Bank and three hospitals in Jerusalem. Convenience sampling was used to choose the hospital sample. However, the total number of beds per administrative style and governorate were taken into account when selecting the participants: HCOs and HCWs.

Using the Steven K. Thompson sample size equation [201], where n is the sample size, N is the population size, p is the estimated population variability (0.5), d is the margin of error (0.05), and the z score is at the 95 percent confidence interval (1.96). In our research, N was the number of HCWs in Palestinian hospitals, which is 36,809 [262]. The required sample size was 381 HCWs. In addition, researchers have recommended that 200 participants or five responders per parameter are appropriate sample sizes for EFA [202–204]. To test structural validity, the sample is split to perform EFA and CFA [205]. We were concerned about the low response rate due to the pandemic's impact on hospitals and HCWs' high workload. Therefore, a total of 800 questionnaires were distributed.

5.3.6 Ethical consideration

The same ethical considerations, IRB of BSC-PATIENT [242], and hospital approvals were also considered and used for BSC-HCW1.

5.3.7 Data collection and participants

Additionally, the same data collection process used in BSC-PATIENT [242] was also used. The inclusion and exclusion criteria were established as a Palestinian doctor or nurse of

either gender who had worked at the examined hospital for at least three months. The included departments were emergency, internal medicine, surgery, gynecology, and pediatrics. The HCWs were conveniently selected in this study based on their presence at the departments during the data collection. It was explained to them that participation was optional. Printed questionnaires were given to respondents instead of sending them through e-mail to reduce nonresponse bias [206].

5.3.8 Statistical Analysis

The Shapiro–Wilk test was used to check the normality of the data. The frequencies were utilized to assess HCWs' sociodemographics and the characteristics of the participating HCOs. EFA was conducted with the Promax rotation approach [208] to examine structural validity for 254 responses. To assess the adequacy of the EFA, the KMO and Bartlett's sphericity tests were used [210]. An eigenvalue of one [211] and a visual assessment of Cattell's scree plot [211] were used to decide whether a component was included or excluded. A factor loading of 0.50 and greater than all cross-loadings of other components determined item inclusion or exclusion [203]. For this part, IBM SPSS statistics 21 software was used.

Second, the remaining 200 responses of the sample were subjected to CFA. The maximum likelihood estimation approach was used in IBM Amos 23 Graphics software (IBM, Wexford, PA, USA). The most often used fit indices were utilized to assess the goodness of fit of the competing models. The minimum discrepancies were split by degrees of freedom less than five and closer to zero, a *P* value greater than 0.05, the GFI, the CFI, TLI, with cutoff values near 0.95, RMSEA of 0.06 and an SRMR value of 0.08. [212,213]. The item inclusion-exclusion decision was set to be based on a factor loading higher than 0.50.

The IIC and CITC were then computed [214]. Items with a correlation greater than 0.85 were considered redundant and eliminated in this analysis [215]. The bottom limit was set at a correlation of 0.30. In addition, the CR per component was assessed to evaluate the internal consistency. CR is preferred over Cronbach's alpha, specifically in structural equation modeling [216]. A CR of 0.60 was deemed adequate [217,218].

Finally, the Fornell-Lacker criterion [219] was employed to assess convergent and discriminant/divergent validity. If the computed AVE was more than 0.50, convergent validity was regarded as appropriate [263]. However, if a value of 0.50 was used with a CR greater than 0.60, the factor's convergent validity was still regarded as satisfactory [219]. To prove discriminant validity, the SQRT should be larger than the correlations with other latent factors [217]. Furthermore, the factor's uniqueness was assessed based on the value of *r* with other

factors at the same scale. As a result, we calculated r , which was classified as negligible when $r < 0.20$, low ($r = 0.20-0.49$), moderate ($r = 0.50-0.69$), high ($r = 0.70-0.85$), or very high ($r = 0.86-1.00$) [221,222]. The lack of a high or very high r between the subscale factors in this study indicated discriminant validity [222].

5.4 Results

5.4.1 Item generation and scoring

In the content validity assessment, the I-CVI results led to the removal of three items and indicated that 15 items required revision. The revised items necessitated additional explanation and rewording. This step increased the S-CVI and CVI-UA from 0.90 and 0.72 to 0.94 and 0.76, respectively.

5.4.2 The instrument's structure and items

The section on HCWs' sociodemographics included age, gender, profession type, working department, years of experience, and total monthly income. Moreover, the questionnaires were coded based on the hospital name, administrative type, location, and JCI accreditation. The second section of the questionnaire was designed to evaluate HCWs' satisfaction predictors based on BSC perspectives and to directly measure their LOY-ATTs.

5.4.2.1 The managerial perspective

This section included (a) an evaluation of managerial performance; (b) the relationship between management and HCWs, such as mutual respect, continuous MANAG-COMM, managerial support, delegation, HCW-ENG, authority, and recognition; (c) the managerial role in HCWs' performance assessment; (d) the clarity of hospital strategy, including its mission and vision and its connection to work plans; and (e) the HCWs' trust in their manager.

5.4.2.2 The financial perspective

It contained five questions that asked the HCWs to evaluate their salary suitability for their competencies and responsibilities, performance-related FINI, compensation fairness, salary slip, and other financial packages and risk-related insurance premiums.

5.4.2.3 The internal perspective

This section contained (a) two questions assessing the implementation of safety standards and the education the HCWs received on IC and safety standards; (b) five questions evaluating the time dimension, including the workload compatibility with the time given, the time spent with each patient, the resting time, and the work-life balance collectively known as WTLB; and (c) three questions to evaluate the supplies and medication quality and the quality prioritization at the hospital in its provided services.

5.4.2.4 The knowledge and growth perspective

The information and innovation section included (a) seven questions addressing the knowledge and growth perspective; (b) three questions that included guidelines on diseases, medication related to HCWs' specialty, IC, and safety standards; (c) two questions that assessed HCWs' accessibility to knowledge and research, and research productivity motivations; and (d) two questions that were used to evaluate job description clarity and the introductory period.

The TECH section included six questions to evaluate the availability of a medical information system at the hospital and the training provided to HCWs to guide their use, the ease of use, and the evaluation for this system in making accessibility to patient records and reports easier and faster and making HCWs work more productive and efficient.

5.4.2.5 The external perspective

This section assessed (a) the hospital location in reference to HCWs' residency and the ease of ACC-EXR in emergency cases and (b) the hospital REPUT compared to other hospitals.

5.4.2.6 The customer perspective

This section assessed (a) internal customer factors: HCWs' satisfaction, intent to stay, recommending hospital to colleagues, teamwork, and emotional exhaustion; (b) external customer factors: the respect of patients toward HCWs was evaluated. Finally, three items in the instrument were designed to be reversed in the statistical analysis: ESS1, which assessed the blame of HCWs when reporting medical errors. Additionally, ESB1 and ESB2 considered HCWs' emotional exhaustion.

5.4.3 The pretest and the internal consistency

The pretest was conducted in a non-governmental hospital in the south of the West Bank. The questionnaire length was deemed to be adequate by HCWs. In addition, the design was well accepted and easy to understand. HCWs made specific small suggestions, which were taken into account. These suggestions were related to a few items that had been reworded. The questionnaire took approximately 7-10 minutes to complete.

After piloting, Cronbach's alpha was calculated for each BSC perspective. Cronbach's alpha was 0.88, 0.63, 0.80, 0.54, 0.83, 0.88, and 0.81 for the managerial, financial, internal, external, knowledge and growth, TECH, and customer perspectives, respectively. To raise Cronbach's alpha, we decided to delete four items: ESF4 and ESF5 from the financial perspective and ESC1 and ESC3 from the customer perspective. We also decided to separate the REPUT items from the ACC-EXR items from the external perspective and move them to the customer perspective, which raised Cronbach's alpha to 0.72 and 0.83, respectively. In conclusion, 51 items remained. The Cronbach's alpha for the instrument was 0.94.

5.4.4 Linguistic validation and translation

The final questionnaire forms in English and Arabic were completed and ready to be used.

Table 10. Number of HCWs and hospitals based on hospital characteristics

Characteristics	Number of HCWs (N=454)	%	Number of hospitals (N=14)	%
Administrative style				
NGO	170	37	5	35.71
Public	145	32	5	35.71
Private	111	24	3	21.43
UNRWA	28.0	6	1	7.14
City				
Hebron	87	19.16	3	21.43
Jerusalem	40	8.81	1	7.14
Nablus	166	36.56	5	35.71
Qalqilya	28	6.17	1	7.14
Ramallah	92	20.26	3	21.43
Tulkarm	41	9.03	1	7.14
Area				
North	235	51.76	7	50.00
Middle	132	29.07	4	28.57
South	87	19.16	3	21.43
Accreditation status				
Yes	97	21.37	3	21.43
No	357	78.63	11	78.57
Size				
Small (No. of beds <80)	133	29.30	5	35.71
Medium (No. of beds 80-160)	188	41.41	5	35.71
Large (No. of beds >160)	133	29.30	4	28.57

Note: UNRWA, The United Nations Relief and Works Agency for Palestine Refugees in the Near East; NGO, non-governmental organization.

5.4.5 Sample size and characteristics

Hospital approvals took six to nine months to obtain since the research took place during the COVID-19 pandemic. Only 15 of the 18 hospitals consented to participate. The data were collected between January and October 2021. The results of the hospital that was included in the pretest were excluded. Then, at the remaining 14 hospitals, we delivered 800 questionnaires, out of which 454 valid questionnaires were retrieved (the response rate was 57%). The characteristics and socio-demographics of the respondents (*Table 10*).

5.4.6 Statistical analysis

5.4.6.1 Testing the normal distribution

The data were not normally distributed. Therefore, nonparametric tests, specifically Spearman correlations, were chosen in the following steps.

5.4.6.2 Structural validity in EFA

EFA for the 51 items resulted in 35 item loadings higher than 0.50 for 15 components. All the components had eigenvalues greater than one. The KMO was 0.832 with a significant Bartlett's test, indicating a high level of sample adequacy [209,217]. The total variation was 66.72% (*Error! Reference source not found.*). The 15 components were TECH, HCW-S CIDEV, MANAG-PE, WTLB, LOY-ATTs, quality of supplies and services (QSS), FINI, HCW-ENG, REPUT, MANAG-COMM, ACC-EXR, introductory period (ITRODP), safety, and no blame error reporting (NBR). However, no item had a loading higher than 0.5 on the 15th component. The scree plot results confirmed only 10 components out of 15, so these 10 were tested in the next step.

5.4.6.3 Structural validity in CFA

CFA was performed for the resulting ten components in EFA. The CMIN/DF was 1.966. However, the other model fit indices were CFI= 0.885, GFI= 0.841, TLI= 0.860, RMSEA= 0.064, and SRMR= 0.0692, with a significant *P* value. Hence, in the next phase, the model was tweaked based on the item loadings, model fit indices, and computations in the convergent, discriminant, CR, IIC, and CITC until the optimal model was reached. For example, the ESC4 item was removed from the MANAG-COMM and was covered with a single-item construct measuring managerial trust (MTR). Additionally, the REPUT component

was converted to the PTR construct. ESR4 and ESL5 items were moved to the LOY-ATTs construct. Moreover, items with loadings less than 0.5 were also removed or relocated to other constructs on which they had better loadings. Moreover, ESE2 and ESE3 items were added to the MANAG-PE construct. Two constructs, QSS and HCW-SCIDEV, were merged into one construct: quality and development (QUALDEV). This was due to the very high correlation between them. This merging also increased the fitness of the model. Finally, eight modification indices were utilized to improve the fit of the model. As a result, the optimal model consisted of nine constructs. The CMIN/DF was 1.334. Additionally, the other model fit indices were CFI= 0.958, GFI= 0.875, TLI= 0.948, RMSEA= 0.041, and SRMR= 0.0557. However, the *P* value was significant (*Figure 17* and *Table 12*).

5.4.6.4 Internal consistency

The CRs for all factors were higher than 0.6. Additionally, all factors' IIC and CTIC were higher than 0.3. The IIC ranged from 0.334-0.703, and the CITC ranged from 0.466-0.729, reflecting satisfactory internal consistency (*Table 13*).

5.4.6.5 Convergent and discriminant validity

For the five factors MANAG-PE, HCW-ENG, QUALDEV, WTLB, and LOY-ATTs, the convergent validity was between 0.4 and 0.5. However, the CRs for all were greater than 0.6, indicating acceptable convergent validity [219]. Correlations between the independent factors were insignificant or low in this context, except for the moderate association between the MANAG-PE factor and HCW-ENG. No high or very high correlations were found between factors. On the other hand, the square roots of the AVE were higher than the off-diagonal correlations between factors. In other words, convergent and discriminant validity were fulfilled for all factors, as seen in *Table 13*. The final items are shown in *Appendix A9*.

Table 11. EFA for BSC-HCW1 components

Component	Item	Item code	Factor														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TECH	Hospital information systems and technology make access to patients' records easier, faster, and more accurate.	EST4	.923														
	The hospital information system and technology make generating reports easier, faster, and more accurate.	EST5	.863														
	The hospital information system and technology make my work efficient and productive.	EST6	.767														
	I believe that the hospital information system interface is user-friendly.	EST3	.736														
HCW-SCIDEV	The hospital provides me with education on medication updates related to my specialty.	ESD3	.972														
	The hospital provides me with access to the latest medical books and journals.	ESD4	.811														
	The hospital provides me with educational updates regarding the diseases in my specialty.	ESD1	.721														
	This hospital provides me with access to the newest books, databases, and scientific papers.	ESD5	.705														
MANAG-PE	I believe that my superiors have the required competencies for their positions.	ESM1		.951													
	My superiors are making the right decisions in work that support the hospital strategy.	ESM2		.804													
	The management in this hospital asks for staff feedback, perceptions, and care for their satisfaction.	ESM3		.515													
WTLB	The quantity of work assigned to me is reasonable with the time given.	ESTI4			.708												
	I have sufficient time to rest and eat during my working day.	ESTI1			.668												
	I can make a work-life balance and good time management.	ESTI3			.660												
	I can spend sufficient time with each patient.	ESTI2			.596												
LOY-ATTs	My overall satisfaction is high.	ESL4				.627											
	I want to keep working in this hospital for several years.	ESL3				.599											
QSS	The hospital medications and disposables are of high quality.	ESQ2					.939										
	The hospital equipment helps me in offering high-quality medical services to patients.	ESQ1					.685										
	Quality is a top priority at this hospital.	ESQ3					.587										

FINI	I receive financial incentives based on my performance.	ESF2	.836															
	I feel that my salary suits my responsibilities and competencies.	ESF1	.529															
HCW-ENG	My manager engages me in the planning and decision-making process.	ESMO5	.670															
	My manager understands and adequately supports me when I face an urgent, complex situation.	ESMO4	.604															
	I am given enough authority and power to make decisions in my position.	ESMO6	.536															
REPUT	I am proud to work with this hospital.	ESR4	.653															
	I believe that patients respect healthcare workers at this hospital and trust them.	ESR2	.637															
	I believe that this hospital has a better reputation than other hospitals in Palestinian.	ESR3	.533															
MANAG-COMM	Communication with management is frequent, and they keep me updated with sufficient information to do my job.	ESC4	.839															
	I trust what my direct manager tells me or promises me.	ESC5	.651															
ACC-EXR	It is easy to access the hospital when a case is urgent.	ESA2	.937															
	The hospital location is close to where I live.	ESA1	.672															
ITRODP	New Employees are well introduced to the job description, and the specifications are clear in the job contract.	ESEM1	.615															
Safety	Safety standards are implemented and assured (masks, gloves, sanitizers, etc.).	ESS2	.663															
NBR	When errors are reported a blame-free policy is taken by managers.	ESS1	.503															
Percentage of Variance (%)				21.08	7.25	4.80	4.46	3.87	3.55	2.86	2.71	2.62	2.49	2.39	2.34	2.16	2.07	2.07
Total variance = 66.72%																		
Eigenvalues				10.75	3.70	2.45	2.27	1.97	1.81	1.46	1.38	1.33	1.27	1.22	1.19	1.10	1.06	1.05

Note: EFA, exploratory factor analysis; TECH, technology; HCW-SCIDEV, healthcare workers' scientific development; MANAG-PE, managerial tasks and performance evaluation; WTLB, workload time-life balance; LOY-ATTs, loyalty attitude; QSS, quality of supplies and services; FINI, financial incentives; HCW-ENG, HCWs' engagement; REPUT, community and reputation; MANAG-COMM, managerial communication; ACC-EXR, hospital accessibility experience; ITRODP, introductory period; NBR, no blame error reporting;

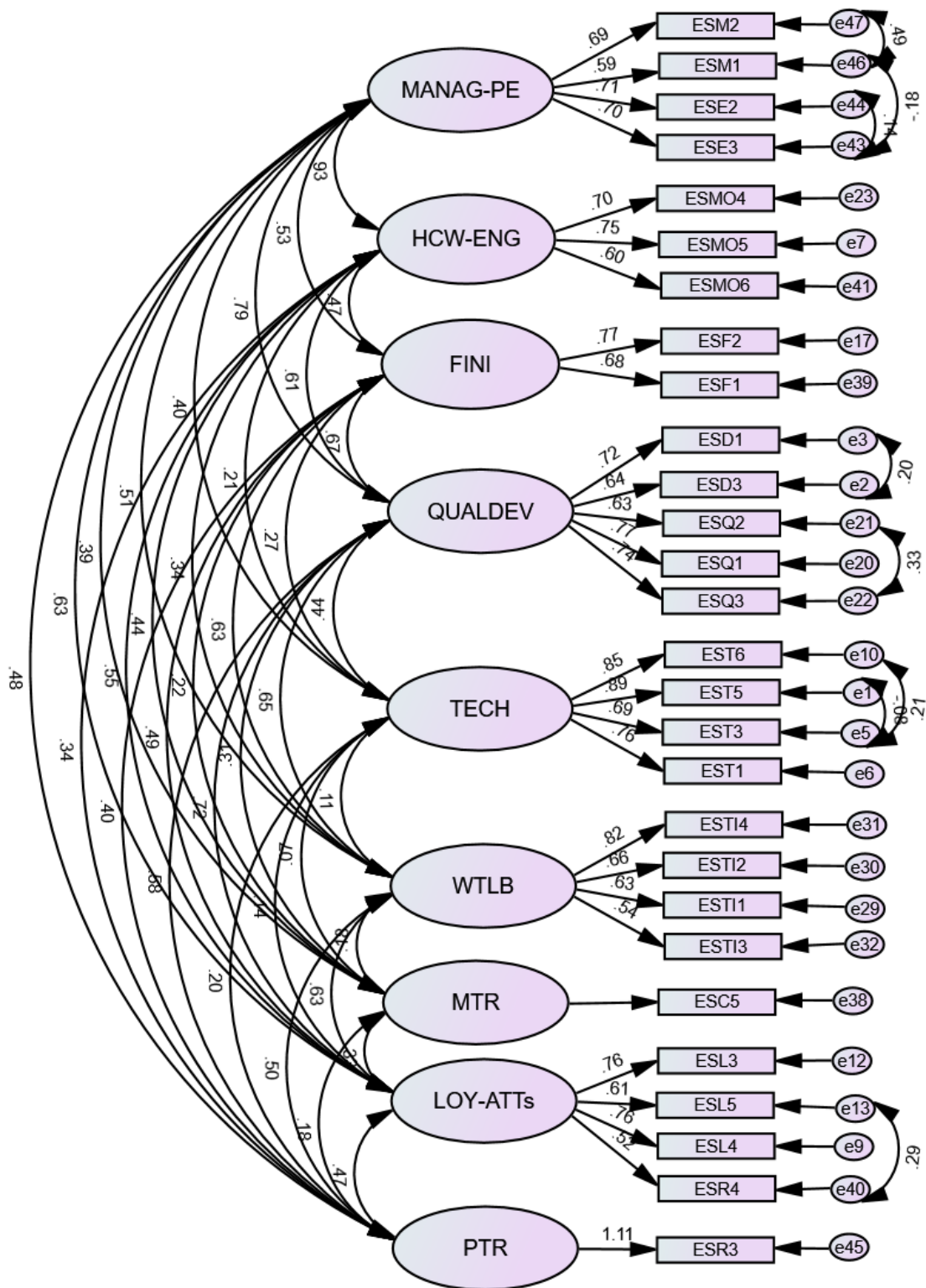


Figure 17. CFA for BSC-HCW1 constructs.

(Source: Own elaboration). Note: CFA, confirmatory factor analysis; MANAG-PE, managerial tasks, and performance evaluation; HCW-ENG, healthcare workers' engagement; FINI, financial incentives; QUALDEV, quality and development; TECH, technology; WTLB, workload time-life balance; LOY-ATTs, loyalty attitudes; MTR, managerial trust; PTR, patient respect toward healthcare workers.

Table 12. The goodness of fit indices in EFA and CFA and results

EFA [209,217,263]		CFA [224]	
Criteria for good fit	Measurements	Criteria for good fit	Measurements
- KMO: 0.6: low adequacy 0.7: medium adequacy 0.8: high adequacy 0.9: very high adequacy	- KMO = 0.832 (Chi-square = 5442.68, degrees of freedom = 1275)	- $\chi^2/df < \text{five}$ and closer to zero	$\chi^2/df = 1.33$
- Bartlett's test <i>P value</i> <0.05	- Bartlett's test <i>P value</i> < 0.001	- The <i>P value</i> > 0.05	<i>P value</i> < 0.001
- Inclusion/exclusion criteria for the components: 1. Eigenvalues \geq one 2. Visual assessment of Cattell's scree plot.	-15 components that have Eigenvalues above one	- GFI - CFI - TLI	GFI = 0.875 CFI = 0.958 TLI = 0.948
-Inclusion/exclusion criteria for the items: 3- The factor loading \geq 0.50. 4- Factor loadings on the assigned factor \geq all cross-loading of other factors.	- Cumulative variance = 66.72% - Cattell's scree plot: keep 10 components.	GFI, CFI, and TLI close to 0.95 - RMSEA < 0.06 - SRMR \leq 0.08	RMSEA = 0.041 SRMR = 0.0557 -Nine constructs

Note: EFA, exploratory factor analysis; CFA, confirmatory factor analysis; KMO, Kaiser–Meyer–Olkin; χ^2/df , minimum discrepancy divided by its degrees of freedom; GFI, the goodness-of-fit index; CFI, comparative fit index; TLI, Tucker–Lewis index; RMSEA, root mean square error of approximation; SRMR, standardized root mean square residual.

Table 13. Factors' IIC, CTIC, CR, convergent, and discriminant/divergent validity

Factor	CR	IIC	CTIC	AVE	MANAG-PE	HCW-ENG	FINI	QUALDEV	TECH	WTLB	LOY-ATTs	MTR
MANAG-PE	0.769	0.373-0.701	0.550-0.653	0.455	0.675							
HCW-ENG	0.727	0.398-0.467	0.503-0.554	0.472	<i>0.503**</i>	0.687						
FINI	0.694	0.493	0.493	0.533	<i>0.288**</i>	<i>0.216**</i>	0.730					
QUALDEV	0.829	0.334-0.581	0.534-0.600	0.494	<i>0.492**</i>	<i>0.364**</i>	<i>0.392**</i>	0.702				
TECH	0.878	0.483-0.703	0.620-0.729	0.645	<i>0.278**</i>	<i>0.253**</i>	<i>0.055</i>	<i>0.296**</i>	0.803			
WTLB	0.760	0.345-0.484	0.483-0.610	0.448	<i>0.308**</i>	<i>0.207**</i>	<i>0.429**</i>	<i>0.446**</i>	<i>0.055</i>	0.670		
LOY-ATTs	0.761	0.364-0.561	0.466-0.645	0.449	<i>0.407**</i>	<i>0.310**</i>	<i>0.341**</i>	<i>0.476**</i>	<i>0.209**</i>	<i>0.455**</i>	0.670	
MTR	-	-	-	-	<i>0.378**</i>	<i>0.397**</i>	<i>0.176**</i>	<i>0.274**</i>	<i>0.117*</i>	<i>0.171**</i>	<i>0.312**</i>	-
PTR	-	-	-	-	<i>0.358**</i>	<i>0.208**</i>	<i>0.319**</i>	<i>0.460**</i>	<i>0.176**</i>	<i>0.378**</i>	<i>0.393**</i>	<i>0.190**</i>

Note: MANAG-PE, managerial tasks, and performance evaluation; HCW-ENG, healthcare workers' engagement; FINI, financial incentives; QUALDEV, quality, and development; TECH, technology; WTLB, workload time-life balance; LOY-ATTs, loyalty attitudes; MTR, managerial trust; PTR, patient respect toward healthcare workers; IIC, interitem correlation; CTIC, corrected item-total correlation; CR, composite reliability; AVE, average variance extracted calculated by the average square of loadings at each factor and used to evaluate the convergent validity; **Bold**, square roots of the average variance extracted; *Italic*, Spearman correlations between independent factors, both are used to assess discriminant validity; *, $P < 0.05$; **, $P < 0.01$, -; single-item factor.

5.5 Discussion

5.5.1 Discussion of the main results

In line with this paper's aim, we developed, translated, and validated the BSC-HCW1 instrument to perform successful HCW-ENG in the evaluation process of BSC perspectives: the financial, internal, knowledge and growth, customer, external, and managerial perspectives. Our findings showed that the final model of BSC-HCW1 resulted in nine factors. Two factors represent dimensions from the managerial perspective: MANAG-PE and MTR. The FIN factor represents a dimension of the financial perspective. The QUALDEV factor reflects a dimension of the internal process. The TECH factor refers to a dimension of the knowledge and growth perspective. Three factors, HCW-ENG, WTLB, and LOY-ATTs, represent dimensions from the customer perspective. Finally, none of the designed variables from the external perspective, such as hospital ACC-EXR and REPUT, were loaded in our model except PTR. MTR and PTR are single-item factors that are compatible with the recommendations for single-item use [45–47]. In general, the final BSC-HCW1 model demonstrated construct, convergent, and discriminant validity. *P* values were statistically significant in CFA because of its sensitivity to data normality. In addition, all of the CFA indices were higher than the cutoff limit, except for the GFI, which was slightly lower than expected. However, according to a study, the GFI value may still be regarded as appropriate if it is more than 0.80 [264].

Additionally, the CR, IIC, and CITC were satisfactory. The occurrence of moderate correlations between factors might be attributed to the existence of causal links between BSC perspectives and dimensions, as numerous BSC studies [25,26] have suggested, not due to the lack of discriminant validity. Specifically, no high or very high correlations were found between factors. Therefore, the BSC-HCW1 proved to be a useful and valid tool to perform HCW-ENG in a comprehensive assessment of the following BSC perspectives: financial, customer, internal process, knowledge and growth, external, and managerial.

The response rate was low, as expected by the authors, which was also perceived by other studies including HCWs during the same period [265,266]. This can be attributed to the high workload HCWs had during the pandemic. The response rate was lower among doctors, which is due to their higher workload and lower numbers than nurses in Palestinian hospitals. This is compatible with two reviews [267,268] that found that the doctors' response rate was lower than that of the general population and recommended effective methodologies to increase their response rate, such as financial incentives. However, three factors had fewer than three items, and two of them had a single item. In some cases, when a factor has a narrow scope and

is unambiguous, using a single item to directly assess this variable is considered more favorable than using multidimensional items [223].

5.5.2 Comparison with BSC studies

BSC reviews revealed that most of the previous implementations did not consider engaging HCWs in the BSC implementations [91,92,104,108,119]. The main focus was only on assessing the HCWs' satisfaction perspective without focusing on the other BSC perspectives [26]. Moreover, heterogeneity in the data collection tool used for evaluating HCWs' satisfaction was perceived [25,30]. This led to the inability to perform a meta-analysis of the BSC impact results [25].

Of the 36 BSC implementations that resulted in the review of BSC dimensions [26], 69.44% did not include HCWs at all in the PE process. A total of 2.77% of the 36 implementations performed staff observations [104]. Only 22.22% of the implementations conducted interviews with HCWs [79,81,85,105,107,109,111,121], through which they evaluated the HCWs' satisfaction level. The use of qualitative methodology was referred to due to the lack of prior evidence and inadequate existing theory [85]. However, two implementations distributed surveys to HCWs, which represented only 5.56% of BSC implementations [93,122]. One of them [93] asked a third party who benchmarks the hospital's employee satisfaction against the other hospitals to measure their physician satisfaction and was presented as the sole KPI in the BSC evaluation, so the survey did not include HCW-ENG in the BSC perspectives evaluation. Another recent study [122] validated a survey to conduct PATIENT-ENG in BSC since they found that the number of tools to measure management practices of health facilities was very limited, and they could not find any evidence that the instruments designed for use in low-middle-income countries had been validated. Unlike the BSC-HCW1, the instrument KPIs were not designed based on a rigorous review of BSC perspectives and dimensions but were built based on the review of other managerial tools. Moreover, unlike the BSC-HCW1, the instrument was validated only using EFA analysis. The resulting dimensions were stakeholder engagement and MANAG-COMM, community-level activities, update of plan and target, MANAG-PE, staff attention to plan, target, and performance, and drugs and financial management. Therefore, the utilized dimensions mainly focused on evaluating to what extent the HCW-ENG is used in management practices but did not conduct actual HCW-ENG in the process of PE from the BSC perspective. The authors of this instrument recommended that further investigation and refinement in this area is still warranted.

5.5.3 Strengths and limitations

The BSC-HCW1 has several strengths. First, it is the first validated instrument designed to apply HCW-ENG in a comprehensive assessment of BSC perspectives: financial, customer, internal process, knowledge and growth, external, and managerial. Second, this is the first validated instrument to conduct PE for Palestinian hospitals based on HCWs' opinions and observations. BSC-HCW1 will help PMOH and health policymakers improve the performance of the health sector and overcome many challenges. For example, there is a lack of existing data measuring such KPIs in the records of many Palestinian hospitals. Additionally, there was a lack of transparency and the unwillingness of many hospitals to share the data extracted from their hospital records externally. The success in using the BSC-HCW1 in the Palestinian healthcare context, which is characterized by fragility and fragmentation both geographically and administratively, may indicate that this instrument can be utilized successfully in other hospitals in low- to middle-income countries or countries that reside under complex situations. Finally, the BSC-HCW1 will solve the heterogeneity in KPIs that were perceived in the previous BSC implementations and will offer a uniform assessment. This will facilitate PE comparisons among hospitals based on area and administrative style. It will also enhance data sharing among hospitals and recommendations among researchers, which will lead to improving hospital performance and a better understanding of HCWs' LOY-ATTs predictors worldwide.

On the other hand, this instrument has some limitations. First, the external perspective dimensions were ultimately excluded during the validation process. A refinement of these perspective items may be included in future versions of the BSC-HCW1. Second, this instrument is solely intended for use by two specific categories of HCWs: physicians and nurses. Both categories are important, as they spend the majority of their time with patients and are ultimately in charge of providing care. However, other categories of HCWs who work in hospitals, such as technicians, pharmacists, and nonclinical HCWs, were not included in this study. Therefore, future versions to include these categories can be beneficial. Third, despite the validation of this instrument during the pandemic, it was developed before it, so it lacks essential items. For example, the assessment of personal protective equipment availability at hospitals during the pandemic. It also lacks an assessment of customer-related variables in this era, such as HCWs' stress and fear and items related to the development and knowledge pertaining to COVID-19 updates. Therefore, it is recommended to consider adding such items to future versions. Moreover, it is recommended to include items that measure types of burnout

other than emotional exhaustion from the customer perspective. Additionally, it is advised to include family-related factors and marital status in the instrument since they may work as modifiers for HCWs' LOY-ATTs. Moreover, we recommend adding items that assess motivation, work control, work stability, access to resources, and prior achievements since they may be predictors of HCWs' satisfaction. Furthermore, some HCWs noted that they were hesitant to provide negative feedback regarding their managers' performance, which may have biased the responses. However, all respondents were informed of the consent form's anonymity and privacy to lower this bias. Additionally, this was explained to them verbally by the data collectors. Additionally, participant bias may have occurred since the sample was convenient and the included hospitals agreed to participate in the research. Nevertheless, the high percentage of the included hospitals (30%) from the total number of hospitals at West Bank and including all administrative style types from all regions may have reduced the selection bias. Another limitation is that due to our inability to access English-speaking patients, we could not verify this instrument in English. Future studies should include the psychometric properties of the BSC-HCW1 in an English-speaking country. Last, because of the vast number of KPIs, the developers of this instrument have decided to only include those dimensions that are directly relevant to the demands of HCWs from each BSC perspective. The development of the second version of BSC-HCW1 that adds the unrelated dimensions to HCWs' demands at each BSC perspective has the potential to significantly improve the level of -ENG in the PE of their hospitals and BSC implementations.

5.5.4 Practical implications

It is strongly recommended that HCO managers worldwide make use of the BSC-HCW1 instrument in future BSC deployments. Researchers need to validate the instrument in other languages and countries worldwide. Consequently, the managers of HCOs will first be able to identify the strengths and shortcomings in the BSC perspectives and dimensions based on the judgments of HCWs. Second, managers will be able to identify which BSC dimensions are predictors of LOY-ATTs by involving HCWs in the evaluation of strategic map dimensions. Eventually, this will provide managers with a direction on how to create their future action plans and where resources should be allocated. Therefore, instead of concentrating only on the level of satisfaction perceived by HCWs, the BSC-HCW1 may be used in the PE of HCOs in general to assess several other aspects. The in-depth analysis offered by this tool will contribute to the area of health management in general and to BSC implementations in particular.

On the other hand, some BSC implementations [93] utilized third-party services outsourcing to benchmark the hospital's HCWs' satisfaction against all the other hospitals, while using BSC-HCW1 will offer hospital managers an easy and inexpensive implementation to conduct HCW-ENG in the PE of hospitals. Based on our observations, the time required for a typical implementation depends on the cooperation of the HCWs. In our case, each hospital required an average month of data collection after receiving approval due to the high workload during the first period of COVID, which may have made it harder for us to accomplish the task. The other reason was that we also distributed the patient questionnaire during the same period at each hospital. In a typical situation, if the HCWs were cooperative, we expected that it would take only 1 week. However, a cross-sectional application for this instrument will only lead to a first- or second-generation BSC. If the hospital intends to apply a third-generation BSC, then we recommend at least one year between the first and the last measurement to assess the impact of implementation as per the resulting implementations in our systematic review [25]. Additionally, monthly or quarterly targets, action plans, and periodic evaluations using BSC-HCW1 and follow-up are needed. HCO managers need to figure out how to motivate HCWs to participate in the process by offering FINI and sharing the final results with them, including how their evaluation participated in improving the PE of their hospital. Additionally, HCO managers should ensure HCWs that they will not impose any accountability on them based on their evaluations. The effect of using BSC-HCW1 may differ from one setting to another. This needs further investigation.

5.6 Conclusion

Researchers and hospital administrators who want to adopt the BSC in hospitals may benefit from utilizing the BSC-HCW1. This instrument might help understand the performance of the perspectives and dimensions of the BSC based on the opinions and observations of HCWs. Most BSC implementation studies did not include HCWs at all or included them simply to gauge their level of satisfaction. Additionally, HCWs' LOY-ATTs were rarely taken into account. None of the BSC implementations were able to get the HCWs to participate in the process of evaluating the perspectives and dimensions of the BSC. The BSC-HCW1 is the first instrument that has been designed specifically to include HCWs in the process of conducting PE using BSC perspectives and dimensions. BSC-HCW1 might let hospital managers look at BSC strategic maps based on what HCWs have observed and what they think. Therefore, it is strongly recommended that researchers make use of BSC-HCW1 in any future BSC

implementations. Another study is needed to produce a second version of this instrument that utilizes HCW-ENG in evaluating the BSC dimensions that are not directly relevant to their needs but are nonetheless related to the PE of HCOs. In addition to HCWs, other stakeholders, such as patients and hospital administrators, must be included in the implementation of BSCs. Palestinian health policymakers and hospital management will be able to assess their strengths and shortcomings based on the observations and views of their HCWs using this instrument. It is possible to make use of this validated instrument in its Arabic form in other Arab nations. However, validation in more languages is still required for this instrument.

Chapter 6: Discussion

This dissertation is a broad project that successfully achieved engaging stakeholders in the PE of Palestinian hospitals. It achieved the four main objectives of its four core studies (*Appendix A10*). First, we performed a systematic review [25] in which we gathered all studies that have measured the impact of implementing the BSC on HCWs' satisfaction, patient satisfaction, and financial performance at HCOs and compared their results. This systematic review offers evidence to HCO and policymakers on the benefits of implementing the BSC in HCO. It supports the positive impact of applying the BSC in HCO, especially on patient satisfaction and financial performance. Second, we performed a systematic review [26] in which we recategorized all the perspectives, dimensions, and KPIs that were employed in BSC implementations for unification purposes; then, we ranked dimensions according to their frequency of use and importance at HCOs. We also developed an illustration tool to be used in the assessment of hospitals' performance. The comprehensive and easy-to-use analysis offered by this tool will contribute to the area of health management in general and to BSC implementations in particular. Third, we developed the BSC-PATIENT instrument [242], which will allow HCO managers to enhance PATIENT-ENG in future BSC implementations. We also customized and validated the developed instrument at Palestinian hospitals. Fourth, we developed the BSC-HCW1 instrument [269] which will allow engaging HCWs in a comprehensive assessment of BSC perspectives and dimensions. Finally, we validated the BSC-HCW1 instrument at Palestinian hospitals.

The two developed and validated instruments are theoretical and practical implications of (*Chapter 3: BSC perspectives and dimensions*). In addition, we performed four implementations described below (*Chapter 8: Theoretical and practical implications*). First, we analyzed the cancer care challenges in Palestine using BSC perspectives and proposed solutions to the Palestinian health policymakers accordingly. Second, we analyzed the 45 BSC sub-dimensions at hospitals during the pandemic based on literature findings. This implication will lead to the authoring of a book in 2023 for hospital management after COVID-19. Based on these 45 sub-dimensions, separate chapters will be devoted to listing and discussing the evidence-based strategies and action plans which proved to effectively improve these sub-dimensions during the pandemic. Co-authors from all over the world will be participating in this big project. Moreover, we performed practical implications for BSC-PATIENT and BSC-HCW1 and Palestinian hospitals. These two implementations facilitated engaging Palestinian patients and HCWs in performing a comprehensive evaluation of Palestinian hospitals based

on BSC perspectives and dimensions, which lead to developing recommendations for Palestinian health policymakers. The developed tools will not only help hospital managers in improving the PEs of their hospitals but will also help the researchers overcome various obstacles. Such as the unavailability of KPI data in many Palestinian hospitals' records, in addition to the lack of transparency and a reluctance to disclose hospital data externally.

The outcomes of this dissertation can be reapplied in low-middle income countries or countries with complex situations; the effectiveness of BSC-HCW1 in the unstable and fragmented Palestinian healthcare system may indicate that it can be employed in their hospitals. Using the generated BSC perspectives, dimensions, BSC-PATIENT, and BSC HCW1 will allow a standardized evaluation in future BSC implementations around the world and facilitate benchmarking. Additionally, it will allow the exchange of ideas and research. Consequently, we may get a greater understanding of the external components that contribute to HCWs' or patients' LOY-ATTs. All of these variables will lead to the overall improvement of hospitals' PE. However, we urge that researchers in other countries use the resulting sub-dimensions to adapt BSC-PATIENT and BSC-HCW1 to their local settings and hospitals' strategies.

In addition to the validation in other languages, we urge that researchers who want to apply BSC-PATIENT and BSC-HCW include other items that may be crucial to assess during the pandemic, such as measuring patient education on IC and the SCI-DEV of HCWs on IC and COVID-19 updates. In addition to emotional exhaustion, various forms of HCW burnout need to be taken into account. Additionally, it is suggested that family-related characteristics and marital status be included in the instrument, as they may serve as moderators for HCW LOY-ATTs. In addition, we suggest including measures that evaluate HCWs' motivation, work control, work stability, access to resources, and past accomplishments, since these may serve as predictors of satisfaction. Consideration of these elements in future versions of BSC-PATIENT and BSC-HCW1 might be advantageous. A further investigation of the PE differences based on the characteristics and socioeconomic factors of respondents as well as the characteristics of hospitals may provide health policymakers with a more complete understanding of the discrepancies and the gaps. At last, we believe that cooperation between hospital administrators, HCWs, and policymakers at the Palestinian Ministry of Health, as well as all administrative hospitals types to enhance stakeholders' engagement culture, as well as linking PE results with practical action plans and a continuous follow-up, is essential for achieving the best possible future results.

Chapter 7: A summary of novel findings

- The first sub-study

The results showed that HCWs' satisfaction and the RoB need to be further improved in future BSC implementations.

- The second sub-study

1. This review solved the dilemma of the KPI categorization difference in BSC implementations, yielding more precise results. The resulting BSC perspectives were financial, customer, internal process, external, knowledge and growth, and managerial, under which 13 major dimensions and 45 subdimensions were defined.

2. This review calculated the use frequency of perspectives and the weights/importance assigned to them. The most frequently used perspectives in BSC papers were internal, financial, patient, learning and growth, HCW, managerial, community, and stakeholder perspectives. The perspectives that had the highest importance were internal, financial, learning and growth, patient, HCW, community, managerial, and stakeholder.

3. This review found a lack of PATIENT-ENG and HCW-ENG in BSC implementation. Additionally, LOY-ATTs of patients and HCWs were rarely taken into account in BSC implementations.

- The third sub-study

1. BSC-PATIENT is the first validated instrument designed to engage patients in BSC perspectives' PE.

2. This instrument was validated in Arabic and customized for Palestinian hospitals with adequate psychometric properties.

- The fourth sub-study

1. The BSC-HCW1 is the first validated instrument designed to engage HCWs in a comprehensive assessment of BSC perspectives: financial, customer, internal process, knowledge and growth, external, and managerial perspectives based on the opinions and observations of HCWs.

2. The BSC-HCW1 is the first validated instrument to conduct PE for Palestinian hospitals based on HCWs' opinions and observations.

Chapter 8: Theoretical and practical implications

The results of the core studies in this dissertation have implications that resulted in drawing recommendations for HCOs' managers and policymakers.

- The first implementation (theoretical):⁵

Figure 18 summarizes a study in which we proposed theoretical implementation solutions to cancer care crises in Palestine based on BSC perspectives (*Chapter 3: BSC perspectives and dimensions*).

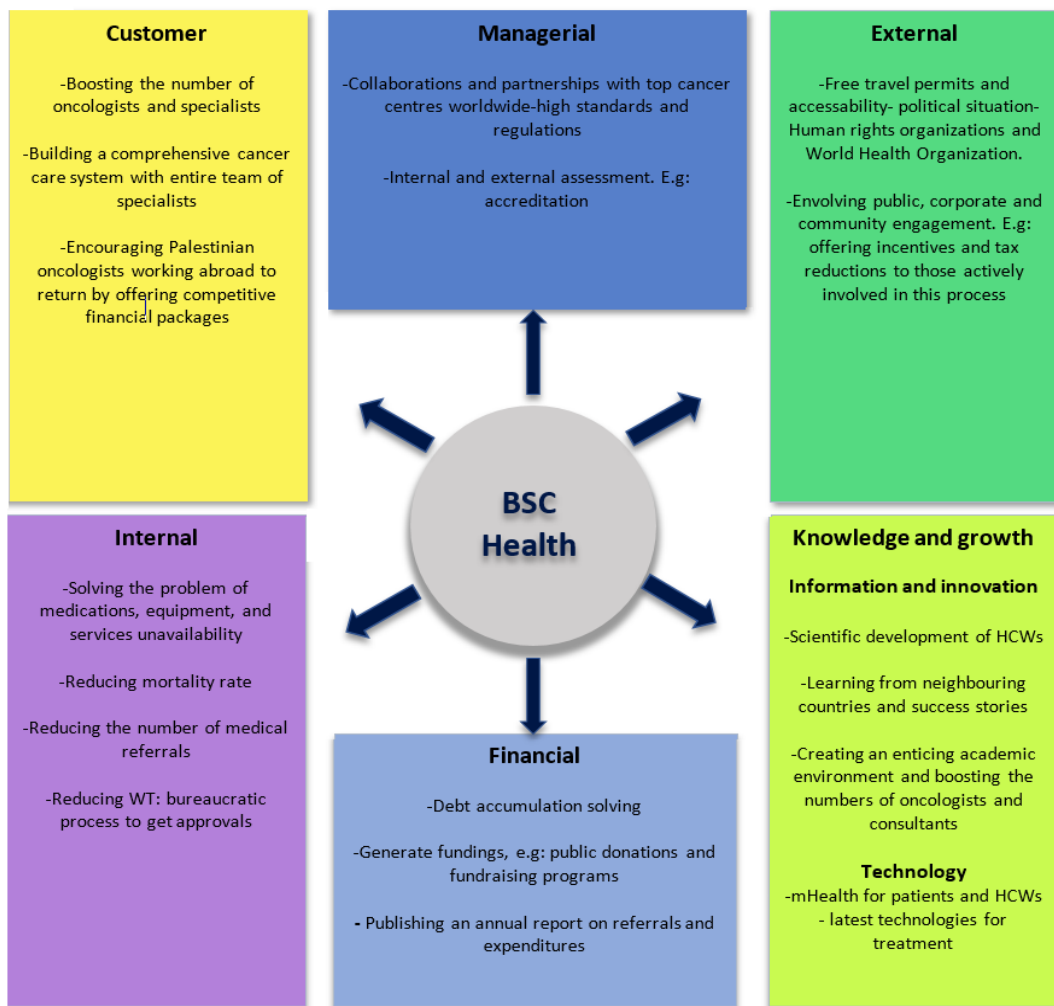


Figure 18. An implication for the BSC six perspectives.

(Source: Own elaboration). Note: proposed solutions for cancer care crises in Palestine; WT, waiting time; HCWs, healthcare workers; HCW-SCIDEV, healthcare workers' scientific development; mHealth, mobile health.

⁵ This analysis was published in: **Amer F.** (2022). Al-Nawati tragedy: a 16-year-old patient with leukaemia and no access to cancer care. *Lancet Oncology*. 23(4):447–9. [https://doi:10.1016/S1470-2045\(22\)00091-2](https://doi:10.1016/S1470-2045(22)00091-2). **Impact factor: 54.433**

- **The second Implementation (theoretical):⁶**

Figure 19 is a theoretical implication to assess the 13 major dimensions and 45 subdimensions that resulted in chapter 4 during the COVID-19 era. The evaluation was performed based on a rapid analysis by searching for independent studies in Google Scholar and the Google search engine during the COVID-19 pandemic until June 2021 [26].

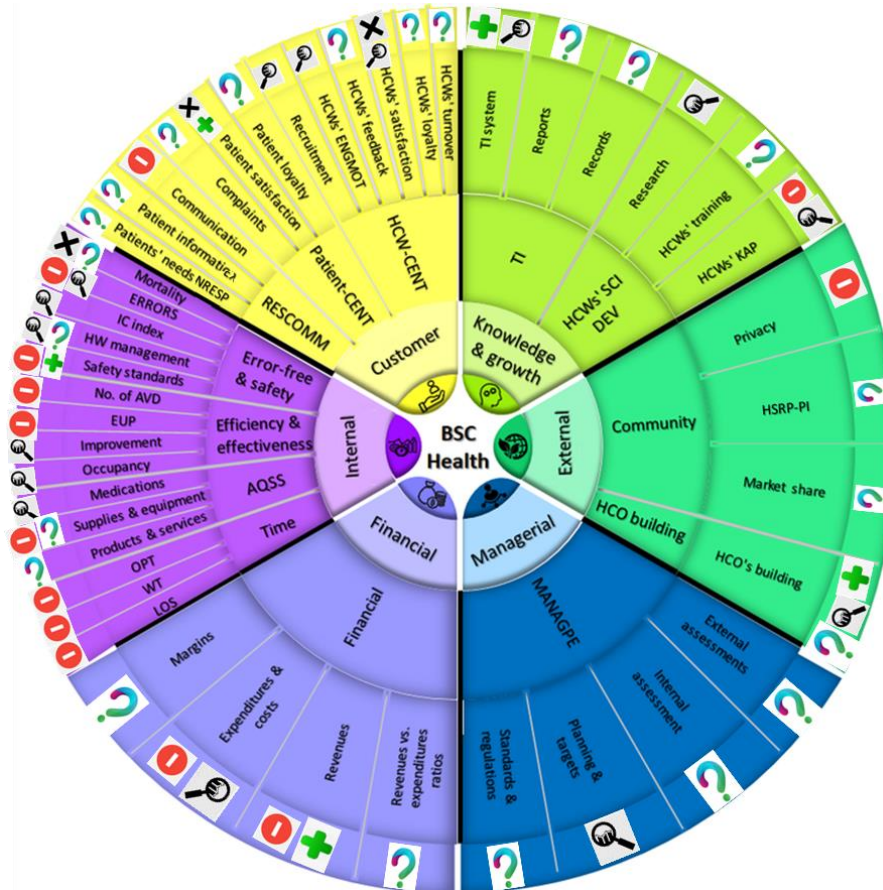


Figure 19. An implication of BSC dimensions. An assessment of the resulting 13 major dimensions and 45 sub-dimensions in the COVID-19 era.

(Source: Own elaboration). Note: BSC, balanced scorecard; HCWs, healthcare workers; HCOs, healthcare organizations; IC, infection control; HW, health waste; WT, waiting time; LOS, length of stay; KAP, knowledge, attitudes, and practices; TECH, technology; HSRP-PI, hospital social responsibility perceived image; ERRORS, errors, accidents, and complications; No. of AVD, the number of admissions, visits, and diseases; EUP, efficiency, utilization, and productivity; AQSS, availability, and quality of supplies and services; OPT, operation processing time; RESCOMINF, needs-response, communication, and information provision; PATIENT-ATTs, patient attitudes; HCW-ENGMOT, healthcare workers' engagement and motivation; HCW-CENT, healthcare workers-centeredness; MANAG-PE, managerial tasks, and performance evaluation; HCW-SCIDEV, healthcare workers' scientific development; INFO-EXR, information experience; LOY-ATT, loyalty attitudes; BUIL-EXR, building experience; REPUT, community, and reputation; NRESP, needs-response.

⁶ This analysis was published as short report preprint: Why Do We Need an Evidence-Based Encyclopedia to Improve Hospitals' Performance after COVID-19?

<https://doi.org/10.21203/rs.3.rs-1970297/v2>

- **The third implementation (practical):⁷**

A practical implication using the BSC-PATIENT instrument [242]. For the statistical analysis, IBM SPSS, IBM Amos, and R softwares were utilized. The variance analysis based on admission status revealed that PATIENT-EXR and PATIENT-ATTs for outpatients need improvement. The multiple regression and path analysis provided strong evidence for the INFO-EXR impact on patients' attitudes. Palestinian health policymakers must prioritize the design and delivery of patient education programs into their action plans and encourage two-way information communication with patients. Strong evidence for the roles of PATIENT-CENT-EXR, SERV EXR, and BUIL-EXR in improving BSCP-ATT was found.

Recommendations for Palestinian health policymakers based on this implementation

Developing a formal training plan for healthcare workers to improve the information provided to patients upon their admission and discharge, including oral and written information. Second, healthcare workers should invest in formal training to improve patients' education, such as education on infection control measures. Third, improving the receipt of information and feedback from patients through the distribution of surveys. Additionally, serious consideration to solve patients' complaints is encouraged. Fourth, increasing the variety of specialties and departments available at Palestinian hospitals, as well as the availability of medical services at night, on vacations, and weekends. Additionally, ensuring the availability of female doctors and nurses in all departments is a demand that can be referred to in Palestinian culture. Fifth, building dimensions, including the environment, such as the cleanliness, infrastructure, and capacity of departments, should be improved. Many patients reported that the number of chairs in the waiting area had to be increased in Palestinian hospitals. Sixth, improving Palestinian outpatients' experiences related to patient care, services, and accessibility, as well as outpatient attitudes toward balanced scorecard perspectives and dimensions. Seventh, engaging patients in hospital performance evaluations by utilizing the developed instrument. This should be carried out routinely to monitor the change and improvement in the quality of health services from patients' observations.

⁷ This study is published as: **Amer F**, Neiroukh H, Abuzahra SE, AlHabil Y, Afifi M, Shellah D, Boncz I, Endrei D (2022). Engaging patients in balanced scorecard evaluation - An implication at Palestinian hospitals and recommendations for policy makers. *Front. Public Health*. 10:1045512. [doi://10.3389/fpubh.2022.1045512](https://doi.org/10.3389/fpubh.2022.1045512)

Impact factor: 6.461

- **The fourth implementation (practical):⁸**

A practical implication of the BSC-HCW1 instrument [269]. For the statistical analysis, IBM SPSS, IBM Amos, and R packages were utilized. The variance analysis revealed no difference between doctors' and nurses' evaluations. The multiple regression and path analysis provided evidence of the importance of improving HCWs' WTLB, QUALDEV, and MANAG-PE in improving the LOY-ATTs of HCWs. All factors revealed PE gaps.

Recommendations for Palestinian health policymakers based on this implementation

Reviewing the system of the financial incentive and linking it with healthcare workers' appraisals and achievements. Second, healthcare workers should be trained and counseled on how to improve their time management and workload time-life balance. Third, they should invest in action plans on how to increase the time that healthcare workers spend with their patients. Fourth, continuous educational programs should be planned and executed to update healthcare workers with information regarding diseases and medication related to their fields. Future utilization of mobile health for such purposes is recommended. Fifth, perform a periodic evaluation of available equipment that requires maintenance or replacement. Additionally, investments in electronic decision support systems can improve the quality and development factor. Sixth, monitoring the performance of healthcare workers and designing an appraisal system that explains their strengths and weaknesses. Moreover, to discuss with them how to utilize their strengths and what actions or development programs are needed to improve their weaknesses. Seventh, managers must strengthen healthcare workers' engagement in planning and decision processes. Eighth, the managerial early awareness of the high-risk groups who intend to leave their jobs and invest in improving their experiences encourages their loyalty attitudes, such as the improvement of workload time-life balance, quality and development initiatives, managerial performance, healthcare workers engagement, and financial incentives. Ninth, focusing on improving the factors that affect the respect of healthcare workers' direct managers, particularly their engagement, managerial performance, and loyalty attitude. Finally, the factors that affect perceived patient respect should be improved, particularly quality and development initiatives, healthcare workers' workload time-life balance, loyalty attitudes, financial incentives, and managerial performance evaluations.

⁸ This study is published as preprint: **Amer F.** (2022). Engaging physicians and nurses in balanced scorecard evaluation - An implication at Palestinian hospitals and recommendations for policy makers. PREPRINT (Version 1) available at Research Square: <https://doi.org/10.21203/rs.3.rs-2235199/v1>

Chapter 9: List of publications and scientific activities during PhD

9.1. Published full-text articles related to the dissertation

Amer F, Hammoud S, Khatatbeh H, Lohner S, Boncz I, Endrei D (2022). The deployment of balanced scorecard in health care organizations: is it beneficial? A systematic review. *BMC Health Services Research*. 22(1), 1–14. <https://doi.org/10.1186/s12913-021-07452-7>.

Impact factor: 2.908

Amer F, Hammoud S, Khatatbeh H, Lohner S, Boncz I, Endrei D (2022). A systematic review: the dimensions to evaluate health care performance and an implication during the pandemic. *BMC Health Services Research*. 22(1), 621. <https://doi.org/10.1186/s12913-022-07863-0>.

Impact factor: 2.908

Amer F, Hammoud S, Onchonga D, Alkaiyat A, Nour A, Endrei D, Boncz I (2022). Assessing Patient Experience and Attitude: BSC-PATIENT Development, Translation, and Psychometric Evaluation—A Cross-Sectional Study. *International Journal of Environmental Research and Public Health*. 19(12):7149. <https://doi.org/10.3390/ijerph19127149>.

Impact factor: 4.614

Amer F, Hammoud S, Khatatbeh H, Alfatafta H, Alkaiyat A, Nour A.I, Endrei D, Boncz I (2022). How to Engage Health Care Workers in the Evaluation of Hospitals: Development and Validation of BSC-HCW1—A Cross-Sectional Study. *International Journal of Environmental Research and Public Health*. 19(15): 9096. <https://doi.org/10.3390/ijerph19159096>.

Impact factor: 4.614

Amer F, Neiroukh H, Abuzahra SE, AlHabil Y, Afifi M, Shellah D, Boncz I, Endrei D (2022). Engaging patients in balanced scorecard evaluation - An implication at Palestinian hospitals and recommendations for policy makers. *Front. Public Health*. 10:1045512. [doi://10.3389/fpubh.2022.1045512](https://doi.org/10.3389/fpubh.2022.1045512)

Impact factor: 6.461

Amer F (2022). Al-Nawati tragedy: a 16-year-old patient with leukaemia and no access to cancer care. *Lancet Oncology*. 23(4):447–9. [https://doi.org/10.1016/S1470-2045\(22\)00091-2](https://doi.org/10.1016/S1470-2045(22)00091-2).

Impact factor: 54.433

9.2 Full text articles related to the dissertation currently under review

Amer F (2022). Engaging physicians and nurses in balanced scorecard evaluation - An implication at Palestinian hospitals and recommendations for policy makers. PREPRINT (Version 1) available at Research Square [<https://doi.org/10.21203/rs.3.rs-2235199/v1>]

Amer F (2022). Why Do We Need an Evidence-Based Encyclopedia to Guide Improving Hospital Performance after COVID-19 ?. PREPRINT (Version 2) available at Research Square [<https://doi.org/10.21203/rs.3.rs-1970297/v2>]

9.3 Abstracts related to the dissertation

Amer F, Neiroukh H, Abuzahra SE, AlHabil Y, Afifi M, Shellah D, Alkaiyat A, Nour A.I, Boncz I, Endrei D (2022). Engaging patients in balanced scorecard evaluation. An implication at Palestinian hospitals and recommendations for policy makers. The First National Health Research Conference. Ramallah, Palestine. **(Honorable Guest and best presentation award)**

Amer F, Hammoud S, Khatatbeh H, Szimonetta L, Boncz I, Endrei D (2022) A SYSTEMATIC REVIEW: WHICH DIMENSIONS TO EMPLOY IN THE PERFORMANCE EVALUATION OF HEALTH CARE ORGANIZATIONS. XXV. Spring Wind Conference. Pécs, Hungary pp 1-797 Paper 490-491. ISBN: 9786158205481. Publication: 32863879 | Published Book: 32834593 (**best presentation award**)

Amer F, Hammoud S, Khatatbeh H, Lohner S, Boncz I, Endrei D (2022). HSD9 The Deployment of Balanced Scorecard in Health Care Organizations: Is It Beneficial? A Systematic Review. ISPOR Washington Conference. Washington. USA. VALUE IN HEALTH (1098-3015 1524-4733): 25 7 p. S481. <https://doi.org/10.1016/j.jval.2022.04.1011>

Amer F, Hammoud S, Khatatbeh H, Lohner S, Boncz I, Endrei D (2022). HSD99 Analysis of the Balanced Scorecard's Customer Subdimensions in Health Care Organizations During the COVID-19 Pandemic. ISPOR Europe Conference. Vienna. Austria. VALUE IN HEALTH (1098-3015): 25 12S. <https://doi.org/10.1016/j.jval.2022.09.1442>

Amer F, Hammoud S, Khatatbeh H, Lohner S, Boncz I, Endrei D (2022). HSD76 Analysis of the Balanced Scorecard's External Subdimensions in Health Care Organizations During the COVID-19 Pandemic. ISPOR Europe Conference. Vienna. Austria. VALUE IN HEALTH (1098-3015): 25 12S. <https://doi.org/10.1016/j.jval.2022.09.1419>

Amer F, Hammoud S, Khatatbeh H, Lohner S, Boncz I, Endrei D (2022). HSD30 Analysis of the Balanced Scorecard's Financial Subdimensions in Health Care Organizations During the COVID-19 Pandemic. ISPOR Europe Conference. Vienna. Austria. VALUE IN HEALTH (1098-3015): 25 12S. <https://doi.org/10.1016/j.jval.2022.09.1374>

Amer F, Hammoud S, Khatatbeh H, Lohner S, Boncz I, Endrei D (2022). HSD53 Analysis of the Balanced Scorecard's Internal Subdimensions in Health Care Organizations During the COVID-19 Pandemic. ISPOR Europe Conference. Vienna. Austria. VALUE IN HEALTH (1098-3015): 25 12S. <https://doi.org/10.1016/j.jval.2022.09.1396>

Amer F, Hammoud S, Khatatbeh H, Lohner S, Boncz I, Endrei D (2022). HSD7 Analysis of the Balanced Scorecard's Knowledge and Growth Subdimensions in Health Care Organizations During the COVID-19 Pandemic. ISPOR Europe Conference. Vienna. Austria. VALUE IN HEALTH (1098-3015): 25 12S. <https://doi.org/10.1016/j.jval.2022.09.1351>

Amer F, Hammoud S, Khatatbeh H, Lohner S, Boncz I, Endrei D (2022). HSD31 Analysis of the Balanced Scorecard's Managerial Subdimensions in Health Care Organizations During the COVID-19 Pandemic. ISPOR Europe Conference. Vienna. Austria. VALUE IN HEALTH (1098-3015): 25 12S. <https://doi.org/10.1016/j.jval.2022.09.1375>

9.4 Additional published full-text articles “health sciences”

Amer F, Hammoud S, Farran B, Boncz I, Endrei D (2021). Assessment of Countries’ Preparedness and Lockdown Effectiveness in Fighting COVID-19. Disaster Medicine and Public Health Preparedness. 15(2): e15-e22. <https://doi:10.1017/dmp.2020.217>.

Impact factor: 5.556

(This article was cited by World Health Organization-Western Pacific and the European Commission in their guidelines to indicate the role of lockdown in mitigating the pandemic consequences).

Hammoud S, Onchonga D, **Amer F**, Kocsis B (2021). The Burden of Communicable Diseases in Lebanon: Trends in the Past Decade. Disaster Medicine and Public Health Preparedness. 1–3. <https://doi.org/10.1017/dmp.2021.200>.

Impact factor: 5.556

Hammoud S, **Amer F**, Lohner S, Kocsis B. (2020). Patient education on infection control: A systematic

review. American Journal of Infection Control. 48(12): 1506–1515.

<https://doi.org/10.1016/j.ajic.2020.05.039>.

Impact factor: 4.303

Biancovilli P, Makszin L, **Amer F**, Csongor A (2022). Celebrities and Breast Cancer: A Multidimensional Quali-Quantitative Analysis of News Stories Shared on Social Media. International Journal of Environmental Research and Public Health. 19(15):9676.

<https://doi.org/10.3390/ijerph19159676>.

Impact factor: 4.614

Hammoud S, **Amer F**, Khatatbeh H, Alfatafta H, Zrínyi M, Kocsis B (2022). Translation and validation of the Hungarian version of the Infection Control Standardized Questionnaire: A Cross-sectional study. BMC NURSING. 21 (244):1-12. <https://doi.org/10.1186/s12912-022-01024-8>.

Impact factor: 3.198

Hammoud S, **Amer F**, Kocsis B (2021). Examining the Effect of Infection Prevention and Control Awareness among Nurses on Patient and Family Education: A Cross-sectional Study. Nursing & Health Sciences. 24(1), 140-151. <https://doi.org/10.1111/nhs.12905>.

Impact factor: 2.214

Onchonga D, Várnagy Á, **Amer F**, Viktoria P, Wainaina P (2021). Translation and validation of the Swahili version of the Wijma Delivery Expectancy/Experience Questionnaire version A (W-DEQ-A). Sexual & Reproductive Healthcare. 29, 100626. <https://doi.org/10.1016/j.srhc.2021>.

Impact factor: 2.194

Khatatbeh H, Al-Dwaikat T, Oláh A, Onchonga D, Hammoud S, **Amer F**, Prémusz V, Pakai A. (2021). The relationships between pediatric nurses' social support, job satisfaction and patient adverse events. Nursing Open. 8(6): 3575-3582. <https://doi.org/10.1002/nop2.907>.

Impact factor: 1.942

Khatatbeh H, Pakai A, Al-Dwaikat T, Onchonga D, **Amer F**, Prémusz V, Oláh A (2021). Nurses' burnout and quality of life: A systematic review and critical analysis of measures used. Nursing Open. 9(3): 1564-1574. <https://doi.org/10.1002/nop2.936>.

Impact factor: 1.942

Alfatafta H, Alfatafta M, **Amer F**, Hammoud S, Zhang L, Molics B, Boncz I (2022). Quality of life of patients with severe knee Osteoarthritis in Hungary. STUDIA UNIVERSITATIS BABES-BOLYAI EDUCATIO ARTIS GYMNASTICAE. 67(2): pp. 5-15 [https://doi.org/10.24193/subbeag.67\(2\).09](https://doi.org/10.24193/subbeag.67(2).09).

9.5 Additional full articles “health sciences” currently under review

Hammoud S, **Amer F**, Khatatbeh H, Kocsis B. What is the current state of Patient and Family education on Infection Control measures? A descriptive study during the COVID-19 pandemic.

Alfatafta H, Alfatafta M, Onchonga D, Khatatbeh H, **Amer F**, Zhang L, Boncz I, Than P, Molics, B. Activity level and quality of life among Hungarian patients undergoing knee replacement surgery and using ActivPAL: A case series

Khatatbeh H, **Amer F**, Hammoud S, Alfatafta H, Boncz I, Pakai A. A theoretical model on nurses' burnout during the COVID-19 pandemic.

9.6 Additional abstracts “health sciences”

Amer F, Atout S, Boncz I, Endrei D (2019). How Does Medication Characteristics Affect Doctors Loyalty in Palestine? Conference: Pécs, Hungary. Pécs: Doctoral Student Association of the

University of Pécs, p. 48. 1. Publication: 30932882 | Published Book: 30926121

Amer F, Atout S, Boncz I, Endrei D (2019). FACTORS INFLUENCING PHYSICIAN'S PRESCRIPTION FREQUENCY AND LOYALTY BEHAVIOR. Conference: Debrecen, Hungary. Association of Hungarian PHD and DLA Students, pp 511-511. ISBN: 9786155586422. Publication: 30944126 | Published Book:30654693.

Amer F, Hammoud S, Farran B, Boncz I, Endrei D. Assessment of Lockdown Effectiveness: Covid-19. (2020). 9th INTERDISCIPLINARY DOCTORAL CONFERENCE 2020 BOOK OF ABSTRACTS. Pécs, Hungary: Doctoral Student Association of the University of Pécs .384 p. p. 57

Amer F (2021). Assessment of countries' preparedness and lockdown effectiveness in fighting COVID-19. Epidemics8 - 8th International Conference on Infectious Disease Dynamics organized by Elsevier.

Hammoud S, Onchonga D, **Amer F**, Kocsis, B (2021). The Burden of Communicable Diseases in Lebanon: Trends in the Last Decade. In: Csiszár, Beáta; Hankó, Csilla; Kajos, Luca Fanni; Mező, Emerencia (eds.) Medical Conference for PhD Students and Experts of Clinical Sciences 2021: Book of Abstracts. Pécs, Hungary: Doctoral Student Association of the University of Pécs. 128 p. p. 18, 1 p.

Khatatbeh H, **Amer F**, Hammoud S, Alfatafta H, Boncz I, Pakai A. (2022). A theoretical model on nurses' burnout during the COVID-19 pandemic. ISPOR Europe. Vienna. Austria. VALUE IN HEALTH (1098-3015): 25 12S. <https://doi.org/10.1016/j.jval.2022.09.2090>

9.7 Book chapters currently under review

Amer F., Mougrabi F (2023). Continuous Education for Pharmacists: Documenting Research Evidence. Encyclopedia of Evidence in Pharmaceutical Public Health and Health Services Research in Pharmacy. Editor: Prof. Zaheer Babar. Springer Nature Ltd.

9.8 Peer-reviews during PhD to 9 of the highest impact factor journals in health sciences verified at Publons Clarivate (total= 15 reviews)

1. International Journal of Health Planning and Management (n=3)
2. Plos One (n=3)
3. BMC Pregnancy and Childbirth (n=1)
4. Journal of Infection and Public Health (n=1)
5. Journal of Medical Internet Research (n=1)
6. Applied Nursing Research (n=1)
7. Disaster Medicine and Public Health Preparedness (n=3)
8. JMIR Medical Informatics (n=1)
9. JMIR Public Health and Surveillance (n=1)

9.9 H-index and citation metrics

MTMT: total citations= 95, independent citation= 55

SCOPUS: citations= 66, H-index= 5

Web Of Science: citations= 57, h-index= 5, peer-reviews= 15

Google Scholar: citations= 122, H-index= 6, i10-index= 5

Research Gate: citations= 127, H-index= 7

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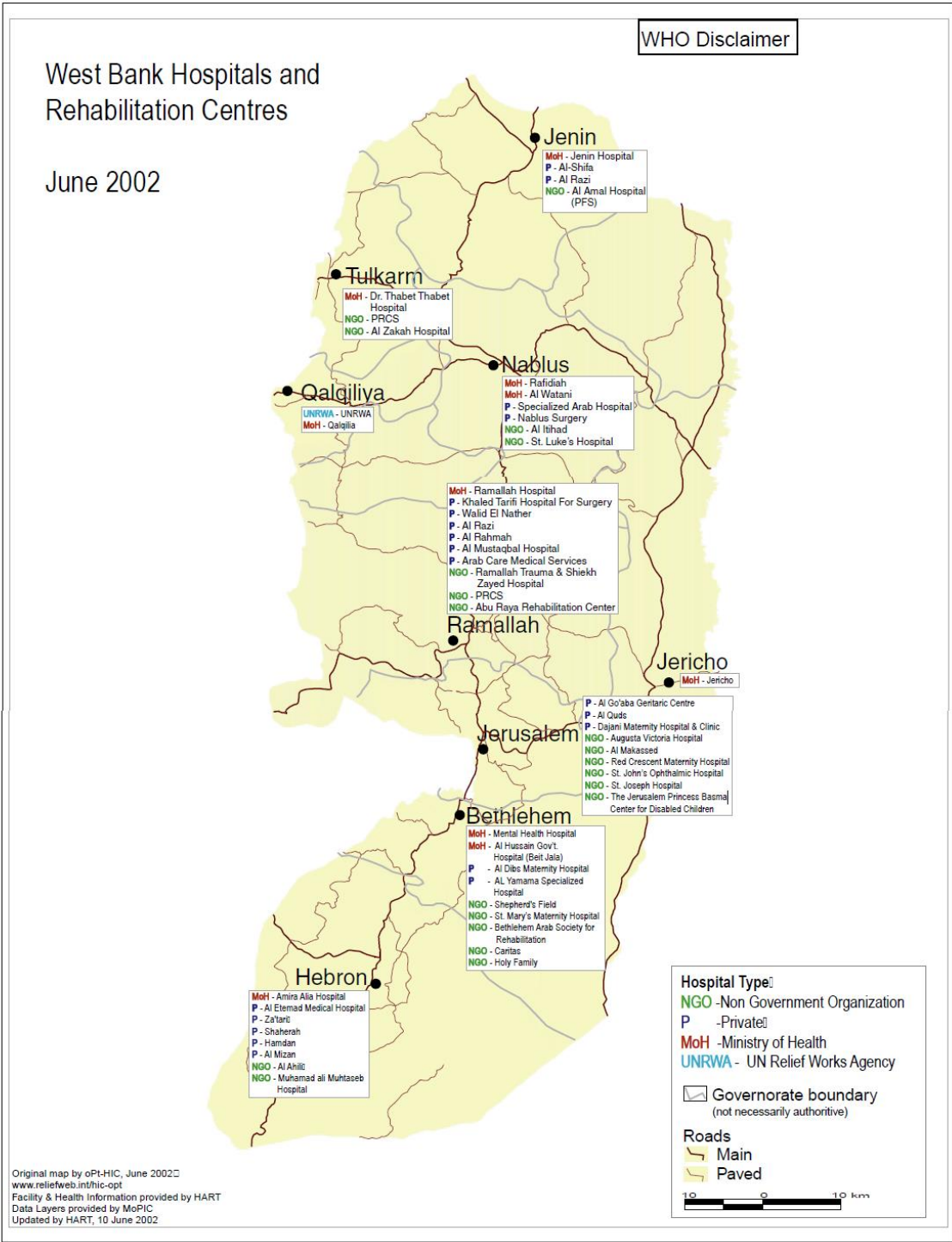
Chapter 11: Appendices

Appendix A1. Maps



Map 1. The geographical separation and the disrupted mobility between the West Bank, Jerusalem, and Gaza [270].

Note: The green area is under Palestinian authority, while the white area is under Israeli authority. The disruption of mobility between Palestinian cities, in addition to the COVID-19 lockdown during the study period, imposed a great challenge on the data collection process. Accessibility to the Gaza strip was impossible.



Map 2. The distribution of the Palestinian hospitals in the West Bank and Jerusalem based on their geographical distribution and administrative type [271].

Note: In our sample, we covered 30% of these hospitals. We included hospitals from the north, middle, and south of the West Bank and Jerusalem. Also, we included hospitals from all administrative types.

Appendix A2. Search strategies for systematic reviews (sub-study 1 and sub-study 2)

Recent queries in PubMed until October 20, 2020		
No.	Query	Items
#1	patient satisfaction[MeSH Terms]	89496
#2	cost-benefit analysis[MeSH Terms]	81191
#3	health care costs[MeSH Terms]	65330
#4	Hospital personnel management[MeSH Terms]	5655
#5	staff development[MeSH Terms]	9396
#6	knowledge management[MeSH Terms]	356
#7	efficiency, organizational[MeSH Terms]	21725
#8	(#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7)	252735
#9	hospitals[MeSH Terms]	274641
#10	hospital department[MeSH Terms]	183457
#11	health[MeSH Terms]	364140
#12	(#9 OR #10 OR #11)	785761
#13	"quality indicators, health care"[MeSH Terms]	21396
#14	(#8 AND #12 AND #13)	699
#15	scorecard*[Text Word]	890
#16	"score card*"[Text Word]	221
#17	(#14 OR #15 OR #16)	1781

Recent queries in Embase until October 20, 2020		
No.	Query	Items
#1	'patient satisfaction'/exp	137588
#2	cost effectiveness analysis'/exp	151323
#3	health care personnel management'/exp	2938
#4	staff training'/exp	13540
#5	productivity'/exp	40473
#6	#1 OR #2 OR #3 OR #4 OR #5	339442
#7	performance measurement system'/exp	8996
#8	'hospital"/exp	1167546
#9	'health center'/exp	33781
#10	'secondary care center'/exp	1375
#11	'tertiary care center'/exp	59133
#12	'health'/exp	699087
#13	#8 OR #9 OR #10 OR #11 OR #12	1867331
#14	#6 AND #7 AND #13	129
#15	scorecard*	1249
#16	"score card*"	504
#17	#14 OR #15 OR #16	1853

Recent queries in Cochrane until October 20, 2020

No.	Query	Items
#1	MeSH descriptor: [Patient Satisfaction] explode all trees	11693
#2	MeSH descriptor: [Cost-Benefit Analysis] explode all trees	6688
#3	MESH DESCRIPTOR Health Care Costs EXPLODE ALL TREES	3350
#4	MeSH descriptor: [Personnel Management] explode all trees	2283
#5	MESH DESCRIPTOR Staff Development EXPLODE ALL TREES	85
#6	MESH DESCRIPTOR Knowledge Management EXPLODE ALL TREES	3
#7	MeSH descriptor: [Efficiency, Organizational] explode all trees	119
#8	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7	21472
#9	MeSH descriptor: [Hospitalization] explode all trees	13176
#10	MeSH descriptor: [Hospital Departments] explode all trees	3404
#11	MeSH descriptor: [Health] explode all trees	8297
#12	#9 OR #10 OR #11	23936
#13	MESH DESCRIPTOR Quality Indicators, Health Care EXPLODE ALL TREES	449
#14	MeSH descriptor: [Quality Assurance, Health Care] explode all trees	3170
#15	#13 OR #14	3523
#16	#8 AND #12 AND #15	111
#17	(scorecard*):ti,ab,kw	29
#18	(score card*):ti,ab,kw	104
#19	#12 OR #13 OR #14	244

Queries in Google scholar and google search engine until October 20, 2020

allintitle: Balanced scorecard implementation Health OR Hospitals OR department	Articles in google scholar	150
allintitle: Balanced scorecard Case study Health OR Hospitals OR department	In Google search engine	3

Appendix A3. Summary of the Final Included Studies (sub-study 1)

Author/s, year of publication	Country	Design of the study	Duration of data collection	Setting	No. of health facilities	No. of participants	Data collection tool/ data sources
Harber, 1998 [96]	Canada	<i>Experimental</i>	NR	Peel Memorial Hospital (Hospital in general + Laboratory)	One	NR	NR
Meliones, 2000 [29]	United States of America - North Carolina	<i>Experimental uncontrolled Interrupted time series</i>	1996-2000	Duke Children Hospital	One	NR	NR
Pink et al., 2001 [86]	Canada	<i>Observational prospective longitudinal</i>	1997-1998	Markham Stouffville hospital	One	NR	Patient surveys + hospitals reports
Gumbus et al., 2003 [87]	United States of America	<i>Case Study/ observational retrospective longitudinal</i>	1999-2001	Bridge port hospital	One	NR	The patient satisfaction measurement system
Smith & Kim, 2005 [92]	United States of America	<i>Observational prospective and retrospective longitudinal</i>	2001-2004	Summa's Food & Nutrition Service Department at Summa Health System (STH & ACH hospitals)	One	NR	Press Ganey's standard inpatient survey + audit checklists
Devitt et al., 2005 [94]	Canada	<i>Observational prospective and retrospective longitudinal</i>	2004-2005	Toronto East General Hospital	One	NR	Data extraction from hospital records
Yang & Tung, 2006 [91]	Taiwan	<i>Retrospective longitudinal/ observational</i>	2000-2002	General hospitals & their supervisor agency	21	NR	Secondary data from the department of health + primary data structured questionnaire measuring hospitals' organizational learning and growth perspective

Lorden et al., 2008 [82]	NR	Multimethod quantitative and qualitative case study/ <i>experimental uncontrolled Interrupted time series</i>	January, 1998- June, 2004	Community hospital	One	300 Inpatient/quarter, 700 outpatient/quarter , 227 employees (1st survey), 191 employees (2nd survey)	Employee satisfaction survey + patient satisfaction survey (via email)
Josey & Kim, 2008 [93]	United States of America - Ohio	<i>Observational retrospective longitudinal</i>	2006	Barberton Citizens hospital (BCH)	One	NR	Patient satisfaction survey
Chang et al., 2008 [95]	Taiwan	<i>Observational retrospective longitudinal</i>	2001-2005	Mackay Memorial Hospital	One	NR	NR
Hansen et al., 2008 [79]	Afghanistan	<i>Observational retrospective longitudinal</i>	July to October of (2004/2005/2006)	Health facilities	>600	1700 HCWs, 5800 patients-provider interaction	NR
Chu et al., 2009 [84]	Tawian	<i>Case study/ experimental uncontrolled Interrupted time series</i>	2004-2006	The nursing department at a public teaching hospital in Taiwan	One	13 reference nurses' group	Financial data from the hospital + questionnaires to executives (the weights of indicators)
Edward et al., 2011 [81]	Afghanistan	<i>Observational retrospective longitudinal</i>	2004-2008	Health facilities in Afghanistan	700	1500 HCWs, 5000 patients	National health services performance Assessment + interviews with patients and HCWs
Fields & Cohen, 2011 [83]	United States of America	<i>Experimental uncontrolled Interrupted time series</i>	2009-2010	Oregon Health and science university family medicine (Clinics)	One	NR	Press Ganey survey for patient satisfaction + medical records.

Koumpour os, 2013 [90]	Greece	Case study/ <i>experimental uncontrolled Interrupted time series</i>	18 months but not specified when exactly	General Panarcadian Hospital of Tripolis	One	NR	Questionnaires and interviews
Smith et al., 2014 [88]	Canada/ Alberta	<i>Experimental uncontrolled pretest-posttest</i>	2010-2011 (12-month trial), March 31, 2013 (results)	Hospitals in Alberta including hip and knee surgeries	12	NR	NR
Abdullah et al., 2014 [97]	Indonesia	Cross- sectional/ <i>observational prospective and retrospective longitudinal</i>	April- December, 2013	Cibto Mangunkusumo Hospital- Digestive endoscopy center	One	76 patients	Endoscopy reports + interviews based on structured questionnaires
Mutale et al., 2014 [80,272]	Zambia	Cluster randomized intervention/ <i>experimental RCT</i>	2011-2013	Health facilities in Zambia	12	96 HCWs, 429 patient interviews, 410 patient observations	A survey in facilities+ interviews with HCWs and patients + patient observation + survey with households
Catuogno et al., 2017 [85]	Italy	Case study/ <i>Experimental uncontrolled pretest-posttest</i>	2007-2008, & 2014- 2015	Hematology department at a Research hospital in Italy	One	14	Stakeholder satisfaction; questionnaires + care processes + hospital discharge report + charity report + research process + departmental report + economic and financial; hospital discharge database + departmental report + charity report
Widyasari & Adi, 2019 [89]	Indonesia	Descriptive Quantitative longitudinal/ <i>observational prospective and retrospective</i>	During the year 2018	Bali Mandara Hospital of Bali (Governmental hospital)	One	30	Participant observation + structured interviews + semi-structured interviews + documentation.

Note: NR, not reported; HCWs, health care workers. *Italic* are designs based on our classification but not reported

Appendix A4. QA and ROB for the resulting studies in the first systematic review (sub-study 1).

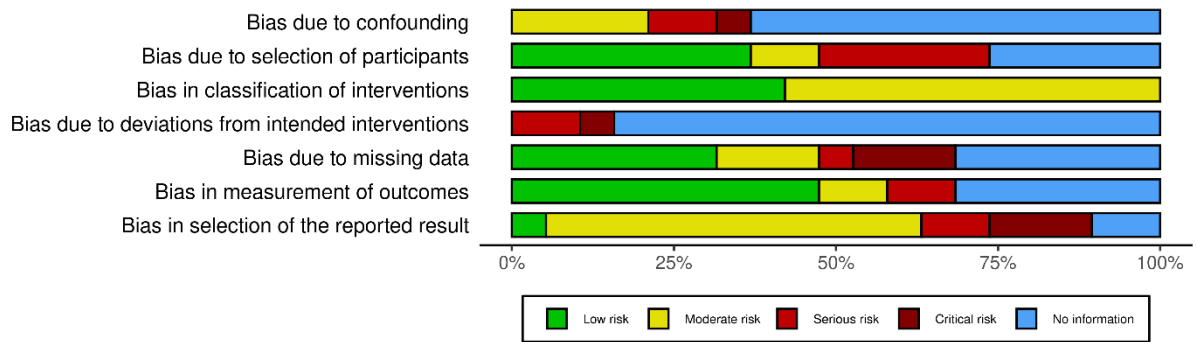
RoB using ROBINS-I tool for non-randomized interventions studies; quasi-experimental and observational studies:

Study	Risk of bias domains						
	D1	D2	D3	D4	D5	D6	D7
Harber, B. W., 1998	?	?	+	?	?	?	!
Meliones, J., 2000	?	+	+	?	?	-	X
Pink et al., 2001	-	+	+	X	-	+	+
Gumbus, A. et al., 2003	?	+	-	?	?	+	!
Smith & Kim, 2005	?	?	-	?	!	+	-
Devitt et al., 2005	?	?	-	?	!	?	-
Yang & Tung, 2006	-	X	-	?	-	+	-
Lorden et al., 2008	X	+	+	!	!	+	-
Josey & Kim, 2008	?	?	-	?	X	?	-
Chang et al., 2008	?	X	-	?	+	?	-
Hansen et al., 2008	-	+	-	?	+	?	-
Chu et al., 2009	!	X	+	?	+	+	-
Edward et al., 2011	X	+	-	X	+	-	-
Fields & Cohen, 2011	-	?	+	?	?	+	!
Koumpouros, Y., 2013	?	+	+	?	+	X	-
Smith, C. et al., 2014	?	X	+	?	?	X	?
Abdullah, M. et al., 2014	?	-	-	?	?	?	?
Catuogno et al., 2017	?	-	-	?	+	+	-
Widyasari & Adi, 2019	?	X	-	?	-	+	X

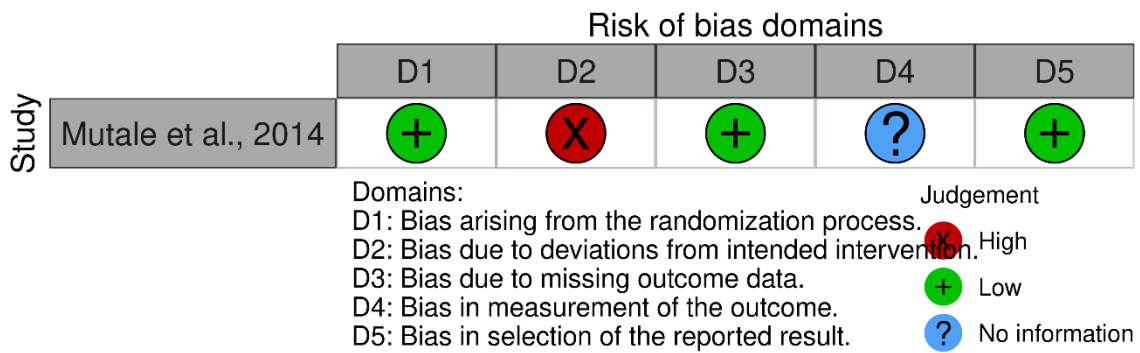
Domains:
D1: Bias due to confounding.
D2: Bias due to selection of participants.
D3: Bias in classification of interventions.
D4: Bias due to deviations from intended interventions.
D5: Bias due to missing data.
D6: Bias in measurement of outcomes.
D7: Bias in selection of the reported result.

Judgement
! Critical
X Serious
- Moderate
+ Low
? No information

(Source: Own elaboration).



RoB using ROB-2 for RCT studies:



(Source: Own elaboration).

Appendix A5. Overview of Included Studies (sub-study 2)

Author(s)	Year of publication	Country	Duration of data collection	Health organization type	Data collection tool	Number of perspectives	Number of indicators	Weight / importance (Yes/No)
Pink et al.[86]	2000	Canada	1997-1998	One hospital	Surveys + hospital reports	4	38	No
Zbinden et al. [118]	2002	Switzerland	April- October 2001	Three departments at a hospital	Personnel statistics and management system + annual reports + questionnaires + accounting system	4	18	Yes
Griffith & Alexander [115]	2002	United States of America	1996-1998	2300 community hospitals	Medicare database	4	9	No
Biro et al. [116]	2003	United States of America	1998-2001	63 centers and clinics	Chart audits + surveys + hospital data	5	17	Yes
Smith & Kim [92]	2005	United States of America	2001-2004	Two departments in two hospitals	Survey + audit checklists	5	24	No
Devitt et al. [94]	2005	Canada	2004-2005	One hospital	Hospital records	5	26	No
Martinez-Pillado et. al. [101]	2006	Spain	2005	One hospital	Hospital records	5	32	No
Goodspeed [117]	2006	United States of America	January 2006	One hospital	NR	4	17	No
Yang & Tung [91]	2006	Taiwan	2000-2002	21 hospitals	Secondary data from the department of health + questionnaires	4	16	No

Chen et al. [110]	2006	China & Japan	In Japan (April 2003- March 2004). In China (January 2003- December 2003)	Two hospitals	Hospital measurement model	4	19	No
Peters et al. [111]	2007	Afghanistan	January-October 2004	617 health facility	National Health Services Performance Assessment + patient interviews + HCWs & community members	6	29	No
Josey & Kim [93]	2008	United States of America	December 2006	One hospital	HCWs' satisfaction survey + Gallup for patient satisfaction	5	26	No
Chang et al. [95]	2008	Taiwan	2001-2005	One hospital	NR	5	12	No
Hansen et al. [79]	2008	Afghanistan	2004-2006	>600 health facility	National Health Services Performance Assessment + patient and HCWs interviews	6	29	No
Chu & Wang [84]	2009	Taiwan	2004-2006	One department at a hospital	Data extraction from hospital financial and performance records + questionnaire to director, assistant directors, head nurses & supervisors	4	11	Yes
Lupi et al. (1) [119]	2011	Italy	2007- 2009	One hospital unit	Data extraction from hospital records	4	26	Yes
Lupi et al. (2) [119]			2008-2009		4	34	Yes	
Edward et al. [81]	2011	Afghanistan	2004-2008	615 health facilities	Performance Assessment + National Health Services patient and HCWs interviews	6	29	No
Chen et al.[113]	2012	Taiwan	2004-2010	67 departments at a medical center	Secondary data collected by repeated measurements	4	9	Yes
Khan et al. [114]	2013	Bangladesh	January-February 2009	637 Health facilities	Questionnaire and exit interview questionnaire for clients	4	19	No
Lin et al. [103]	2013	China	July 2008- December 2009	One hospital unit	NR	4	32	Yes

Ajami et al. [104]	2013	Iran	NR	One hospital department	Top managers interview questionnaires + staff observations	4	20	No
Mutale et al. [80]	2014	Zambia	2011-2013	12 health facilities	HCWs & patient Interviews + patient observations + households survey	7	20	No
Rowe et al. [105]	2014	Afghanistan	March-August 2010	24 health facilities	Patient-provider clinical interactions observations+ Patient follow-up exit interviews + HCWs interviews + facility record audits	5	26	No
Edward et al. (1) [106]						2	19	No
Edward et al. (2) [106]	2015	Afghanistan	2012	One health facility	Quantitative and qualitative community survey	2	16	No
Edward et al. (3) [106]						2	17	No
Rabbani et al. [107]	2015	Pakistan	2012	Six health centers	Survey + services assessment + patient questionnaire exits interviews + HCWs' questionnaire interview	5	20	No
Teklehaimanot et al. [121]	2016	Ethiopia	January – February 2010	433 health facilities	Structured & semi-structured internationally accepted questionnaires (health facility audit + HCWs' interviews, community interviews)	6	32	No
Catugno et al. [85]	2017	Italy	2007-2008 & 2014 -2015	One department at a hospital	Stakeholder satisfaction questionnaires + hospital discharge report + charity report + departmental report + hospital discharge database	4	25	No
Gao et al. [108]	2018	China	NR	Five hospitals	HCWs' questionnaires + Patient interview-based questionnaire + technique for order of preference	4	36	Yes

						by similarity to ideal solution method		
Ebrahimpour et. Al [102]	2019	Iran	2010-2017	One hospital	Hospital records	4	23	No
Widyasari & Adi [109]	2019	Indonesia	During 2018	One hospital	structured interviews + semi-structured interviews + documentation + Observation	4	11	Yes
Mabuchi et al. [122]	2020	Nigeria	April-May, 2016	111 primary health facilities	Survey + interview questionnaire	6	32	No
Manolitzas et. al. [120]	2020	Greece	NR	One hospital department	Interviews + hospital records + observation	4	11	Yes
Gonzales et. al. [123]	2020	NR	NR (but data extracted 2018-2019)	One medical center	Hospital records	8	13	No
						<u>Average</u> 4.5	<u>Average</u> 22	<u>Total</u> Yes: 10 No: 26

Note: HCW, health care workers; NR, not reported.

Appendix A6. The description of each major and sub-dimension (sub-study 2)

Table (3): Description of the BSC major- and sub-dimensions

	The major-dimensions	Description	Description of sub-dimensions and their KPIs:
1	Managerial tasks and performance evaluation - dimension	Part of the internal perspective. However, some studies added it under the managerial perspective [122,123]. It constitutes four sub-dimensions.	<p>The first sub-dimension: Standards and regulations, can be reflected by the standardization capability for different HCO working processes. Moreover, the HCWs’ awareness of these standards and regulations highlights the importance of the rules and standards being clear, understandable, and specific to them.</p> <p>The second sub-dimension: Planning and targets sub-dimension incorporated business plan and target setting, updating, and HCWs’ awareness and attention to them.</p> <p>The third sub-dimension: Internal assessment sub-dimension using managerial quality tools for quality enhancement, managing objectives, or the PE. For example, the included studies assessed the implementation of a continuous quality improvement system, management by objectives, trauma quality improvement program, quality oncology practice initiative, and BSC, or the scores that resulted from using different instruments and scales such as Press Ganey. This dimension also includes the internal PE process, such as regular performance review meetings, the visualization of performance data, and the HCWs’ attention to performance.</p> <p>The fourth sub-dimension: External assessments include the accreditation, peer reviews, and certificates the HCO receives from external sources. It includes evaluating the accreditation status of the HCO, such as JCI or American Accreditation Commission International, plans to maintain it, and the performed periodic revising of the accreditation manuals. It also includes the certificates the HCO received, such as the ISO certificate and the peer reviews.</p>

2	Financial - dimension	<p>Represented as the financial perspective in BSC.</p> <p>It consisted mainly of four sub-dimensions.</p>	<p>The first sub-dimension: Margins such as the cash flow margin and the operating profit margin.</p> <p>The second sub-dimension: Expenditures and costs such as personnel costs, controllable costs, and the cost per case or admission.</p> <p>The third sub-dimension: Revenues as the revenue per admission and the return per employee.</p> <p>The fourth sub-dimension: Revenues versus expenditures ratios, such as, return on assets, return on investments and capital turnover.</p>
3	Error-free and safety -dimension	<p>Part of the internal perspective of BSC.</p> <p>It composed of five sub-dimensions</p>	<p>The first sub-dimension: Mortality, such as net death rate per 1000 patients or gross mortality.</p> <p>The second sub-dimension: Errors, accidents, and complications sub-dimension, which contained KPIs such as complications index, hospitalized accident rate, medication error rate, blood preparation error, and pneumonia complications.</p> <p>The third sub-dimension: IC index such as postoperative infection rate and infection prevention.</p> <p>The fourth sub-dimension: HW management includes segregating waste into proper sharps, infectious, pathological, pharmaceutical, radioactive, and nonhazardous waste disposals. As well as waste minimization, color-coding, labeling, handling, transports, storage, treatment, and disposal.</p> <p>The fifth sub-dimension: Safety standards focused on patient safety through the appropriate efforts to avoid adverse events related to errors in diagnosis, medication, or treatment, such as the full implementation of the 27 Safe Practices for Better Health care standards and percentage implementation of the National Patient Safety Goals.</p>

4	Efficiency and effectiveness - dimension	Part of the internal perspective. Through this dimension, four sub-dimensions are mainly focused on.	<p>The first sub-dimension: The number of admissions, visits, and diseases; which evaluated the number of patients, surgeries, admissions, readmissions, cross-appointments, and disease scores.</p> <p>The second sub-dimension: Efficiency, utilization, and productivity included KPIs such as the case mix index, productivity percent, service utilization, ER patients per year per doctor, admitted inpatients per year and doctor, bed turnover rate, and nurses' workload.</p> <p>The third sub-dimension: The improvement sub-dimension, such as the cure rate, recovery, and improvement rates.</p> <p>The fourth sub-dimension: Occupancy, which mainly focused on bed occupancy rate, indicates the percentage of beds occupied by patients in a given period</p>
5	Availability and quality of supplies and services - dimension	Part of the BSC internal perspective. Under this dimension, three sub-dimensions are mainly focused on.	<p>The first sub-dimension: Medications, which included drug management, drug availability index, and tracer drug index.</p> <p>The second sub-dimension: Supplies and equipment, such as supply distribution system and equipment functionality index.</p> <p>The third sub-dimension: Products and services, this sub-dimension included KPIs, which evaluate either the variety of medical services or products offered by the HCO or their quality.</p>
6	Time -dimension	Part of the BSC internal perspective. It composed of three sub-dimensions.	<p>The first sub-dimension: Operating processing time is the time needed from the initiation of service until completion, for example, billing time, treatment time, correcting mistakes time, retrieving an archived file time, etc.</p> <p>The second sub-dimension: WT or the delay time until providing services is initiated.</p> <p>The third sub-dimension: LOS of an admitted patient till discharge.</p>

7 The HCW-centeredness - dimension	Either a part of the customer or the internal perspectives at BSC, while some studies added it under the HCWs management perspective [92–94,106,111,122]. It consisted of six sub-dimensions.	<p>The first sub-dimension: Staffing and recruitment process starts from employment to the introduction process of the new employees.</p> <p>The second sub-dimension: HCW-ENG and motivation include engaging doctors and nurses in the HCO managerial decisions and plans, high-performing HCWs rewarding, upgrade rate on the career ladder, involvement in bonus decisions, and evaluation of HCWs motivation and burnout rates.</p> <p>The third sub-dimension: HCWs’ feedback, for example, HCWs perception index surveys.</p> <p>The fourth sub-dimension: HCWs’ satisfaction by doctors’, nurses’, and other HCWs’ satisfaction rates evaluation.</p> <p>The fifth sub-dimension: HCWs’ loyalty index includes the doctors’ and nurses’ willingness to stay at the same HCO for another five years and recommend their colleagues to work at their HCO.</p> <p>The sixth sub-dimension: HCWs’ turnover which assessed the number of doctors, nurses, etc., who left their jobs at that HCO in a specific period.</p>
8 Patient loyalty attitudes - dimension	It is usually evaluated as a part of BSC customer or stakeholder perspectives. It included focusing on three sub-dimensions.	<p>The first sub-dimension: Complaints which mainly concerned with measuring the patients’ complaint rate.</p> <p>The second sub-dimension: Patient satisfaction is focused on measuring patient satisfaction rate in general or the satisfaction rate+ specific toward a medical service, a specific HCWs dimension, or in a particular HCO department.</p> <p>The third sub-dimension: Patient loyalty is usually measured by patient retention and recommendations for that HCO.</p>

9 Patient needs-response, communication, and information provision - dimension	It is usually part of the customer perspective in BSC. It is composed of three sub-dimensions.	<p>The first sub-dimension: Patient NRESP, including response to their inquiries and feedback. This was performed either after the patient arrival, during the admission and the treatment process, or before the discharge.</p> <p>The second sub-dimension: Patient INFO-EXR includes patient information, education, guidelines, counseling, and consultation services.</p> <p>The third sub-dimension: Communication included evaluation of the nature of both internal and external communications, for example, the ability of coordination and teamwork among HCWs, and the relationships between HCWs and patients.</p>
10 Community and reputation - dimension	Part of the customer perspective, while some studies [95,106,119,121,122] added it under the community and social perspective. It consists of three sub-dimensions.	<p>The first sub-dimension: Market share evaluation for the HCO in general or for a specific department at that HCO.</p> <p>The second sub-dimension: The HSRP-PI focused on the exemptions offered by the HCO for poor patients, benefits provided to the community, teaching and training programs offered for medical students, and the community satisfaction rate.</p> <p>The third sub-dimension: Privacy and female considerations evaluated the percentage of female patients, the availability of female doctors and nurses in the HCO, and the patients' privacy adherence. Although the female consideration in HCOs may not have significant importance in all cultures. However, it was vitally considered in some implementations [81,105,106,111,114].</p>
11 HCO building - dimension	It is usually part of the internal or the customer perspectives. It included one sub-dimensions	Composed of one sub-dimension, it included KPIs which are related to BUILCAP-EXR and BUILENV-EXR. For example, HCO's capacity, ER volume, waiting area, bathroom, cleanliness, water, electricity, appointments, ACC-EXR, and ambulance availability.

12 The information and innovation - dimension	Part of the innovation and knowledge, or the customer perspectives. It is composed of three sub-dimensions.	<p>The first sub-dimension: HCWs' KAP, which concentrated on the HCWs' current competencies and knowledge in different medical and health-related fields, the percentage of skillful employees, and their attitudes, behavior, and punctuality.</p> <p>The second sub-dimension: HCW-SCIDEV, through which the number of training seminars, and courses performed to improve the HCWs' KAP and the budget specified for this purpose was evaluated.</p> <p>The third sub-dimension: Research and scientific productivity, can be a result when the previous two sub-dimensions are improved. For example, impact factor per HCW, total research impact of the HCO, number of participations in conferences and research programs per year, and the expenditure on medical research.</p>
13 The technology-dimension	Part of the innovation and knowledge perspective. It consists of three sub-dimensions.	<p>The first sub-dimension: Records, such as patient record index, health management information system records, hospital laboratory registrations, and medical records completion rate.</p> <p>The second sub-dimension: Reports, which included the ability to produce reports for different purposes in different HCO departments.</p> <p>The third sub-dimension: TECH system, which was reflected by assessing the health management information system effectiveness, and the intensity of information use.</p>

Note: BSC, balanced scorecard; KPIs, key performance indicators; IC, infection control; HW, health waste; ER, emergency room; WT, waiting time; LOS, length of stay; HCO, health care organization; HCWs, health care workers; HCW-ENG, health care workers' engagement; KAP, knowledge, attitude, and practices; HCW-SCIDEV, health care workers' scientific development; TECH, technology; HSRP-PI, hospital social responsibility perceived image; PE, performance evaluation; JCI, Joint Commission International; ISO, International Organization for Standardization; REPUT, community, and reputation; ACC-EXR, accessibility experiences; BUILCAP-EXR, building capacity experience; BUILENVEXR, building environment experience; NRESP, needs-response; INFO-EXR, information experience.

Appendix A7. RoB for the second systematic review (sub-study 2)

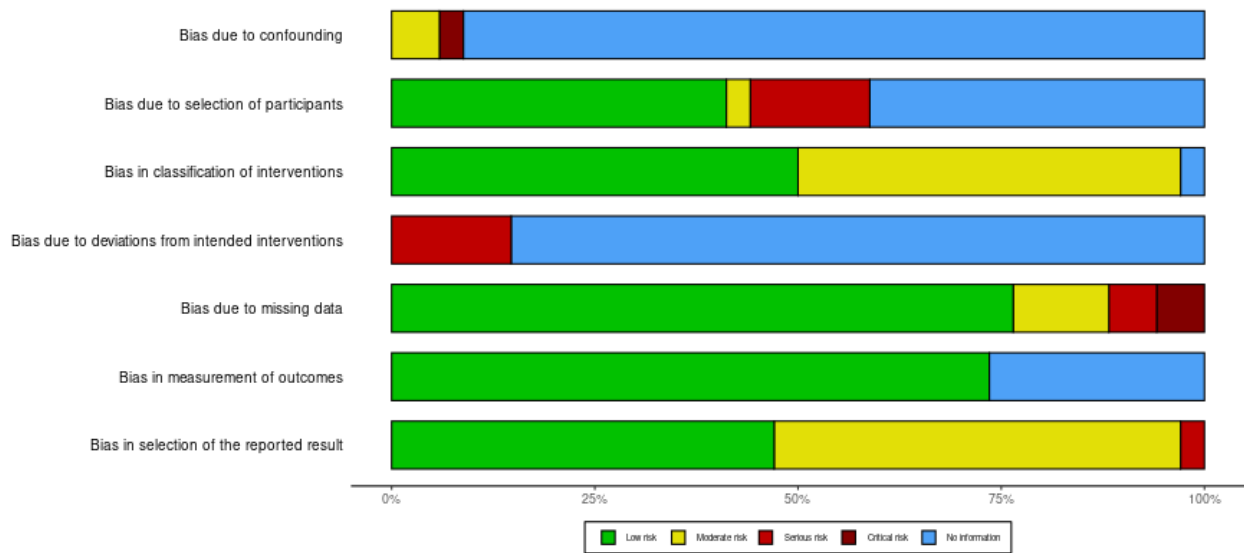
RoB using ROBINS-I tool for non-randomized interventions studies; quasi-experimental and observational studies:

Study	Risk of bias domains						
	D1	D2	D3	D4	D5	D6	D7
Pink et al., 2001	⊖	⊕	⊕	⊗	⊖	⊕	⊕
Zbinden et al., 2002	?	⊕	⊕	⊗	⊗	⊕	⊕
Griffith & Alexander, 2002	?	?	⊖	?	⊕	⊕	⊕
Biro et al., 2003	?	⊕	⊖	?	⊕	⊕	⊕
Smith & Kim, 2005	?	?	⊖	?	⊗	⊕	⊕
Devitt et al., 2005	?	?	⊖	?	⊗	?	⊖
Martinez-Pillado et al., 2006	?	?	⊕	?	⊖	⊕	⊕
Goodspeed, 2006	?	?	⊖	?	⊕	⊕	⊕
Yang & Tung, 2006	⊖	⊗	⊖	?	⊖	⊕	⊖
Chen et al., 2006	?	⊕	⊕	?	⊕	⊕	⊕
Peters et al., 2007	?	⊕	⊖	?	⊕	?	⊖
Josey & Kim, 2008	?	?	⊖	?	⊗	?	⊖
Chang et al., 2008	?	⊗	⊖	?	⊕	?	⊖
Chu et al., 2009	⊗	⊗	⊕	?	⊕	⊕	⊖
Lupi et al., 2011 (1)	?	⊕	⊕	?	⊕	⊕	⊕
Lupi et al., 2011 (2)	?	⊕	⊕	?	⊕	⊕	⊕
Edward et al., 2011	?	⊕	⊖	⊗	⊕	?	⊖
Chen et al., 2012	?	?	⊖	?	⊕	?	⊕
Khan et al., 2013	?	?	⊖	?	⊕	?	⊖
Lin et al., 2013	?	⊕	⊕	?	⊕	⊕	⊕
Ajami et al., 2013	?	⊕	⊕	?	⊕	⊕	⊕
Rowe et al., 2014	?	⊗	⊖	⊗	⊕	?	⊖
Edward et al., 2015 (1)	?	?	⊕	⊗	⊕	⊕	⊖
Edward et al., 2015 (2)	?	?	⊕	?	⊕	⊕	⊖
Edward et al., 2015 (3)	?	?	⊕	?	⊕	⊕	⊖
Rabbanian et al., 2015	?	?	⊕	?	⊕	⊕	⊖
Teklehaimanot et al., 2016	?	?	⊖	?	⊕	⊕	⊕
Catuogno et al., 2017	?	⊖	⊖	?	⊕	⊕	⊖
Gao et al., 2018	?	⊕	⊕	?	⊕	⊕	⊕
Ebrahimpour et al., 2019	?	⊕	⊕	?	⊕	⊕	⊖
Widyasari & Adl, 2019	?	⊗	⊖	?	⊖	⊕	⊗
Mabuchi et al., 2020	?	⊕	⊕	?	⊕	⊕	⊖
Manolitzas et al., 2020	?	⊕	⊕	?	⊕	⊕	⊕
Gonzales et al., 2020	?	?	?	?	⊕	?	⊖

Domains:
D1: Bias due to confounding.
D2: Bias due to selection of participants.
D3: Bias in classification of interventions.
D4: Bias due to deviations from intended interventions.
D5: Bias due to missing data.
D6: Bias in measurement of outcomes.
D7: Bias in selection of the reported result.

Judgement
⊗ Critical
⊗ Serious
⊖ Moderate
⊕ Low
? No information

(Source: Own elaboration).



RoB using ROB-2 for RCT studies:

		Risk of bias domains				
		D1	D2	D3	D4	D5
Study	Mutale et al., 2014	+	X	+	?	+

Domains:
D1: Bias arising from the randomization process.
D2: Bias due to deviations from intended intervention.
D3: Bias due to missing outcome data.
D4: Bias in measurement of the outcome.
D5: Bias in selection of the reported result.

Judgement:
X High
+ Low
? No information

(Source: Own elaboration).

Appendix A8. The final resulted items in BSC-PATIENT validation-English (sub-study 3)

Construct	Code	No.	Question
PATIENT-CENT-EXR	PCU4	Q1	This hospital distributes surveys to assess my satisfaction before discharge
	PCU3	Q2	This hospital distributes surveys to assess my needs upon arrival at the hospital, admission, or during the stay
	PLE11	Q3	This hospital follows up with me after the discharge
	PCU5	Q4	My complaints are taken seriously into consideration and solved immediately at this hospital
	PLE6	Q5	Staff trained me on infection precaution measures such as hand hygiene, cough etiquette, isolation rationale, personal protective equipment, etc...
PR-EXR	PFI2	Q6	I pay a reasonable price for the other medical services (laboratory, radiology, etc...) at this hospital
	PFI3	Q7	I pay a reasonable price for the medications at this hospital
	PFI1	Q8	I pay a reasonable price for the medical consultation at this hospital
BUILEN-EXR	PEN13	Q9	There is a sufficient number of chairs in the waiting area
	PEN12	Q10	The hospital has clean departments, corridors, rooms, bathrooms
BUILCA-EXR	PEN14	Q11	The capacity of departments at this hospital including (ER, ICU, waiting room, etc.) is sufficient enough
	PEN11	Q12	This hospital has new building infrastructure (walls, ceiling, bathrooms, etc...)
ACC-EXR	PEN4	Q13	The accessibility to this hospital is easy by either public transportation or my car
	PEN5	Q14	The accessibility to this hospital in an emergency is easy
INFO-EXR	PLE4	Q15	The information provided to me to be used after discharge is sufficient (medication and side effects, health condition, etc...)
	PLE3	Q16	Oral and written information provided to me or my family during my hospital experience is sufficient
	PLE2	Q17	Information and guidance provided at admission or the first visit are sufficient
SERV-EXR	PEN8	Q18	Female doctors are available at this hospital
	PIN12	Q19	There are a variety of departments at this hospital
	PIN18	Q20	Medical services at night, on vacations, and on weekends are available at this hospital
	PIN15	Q21	There are a variety of specialties at this hospital
BSCP-ATTs	SAT3	Q22	I will recommend this hospital to my family and friends
	PIN1	Q23	I believe I receive an accurate medical examination at this hospital
	PEN3	Q24	I believe this hospital offers me better treatment than the other Palestinian hospitals
	SAT1	Q25	My overall satisfaction with this hospital's performance is high
	PEN1	Q26	I believe this hospital has a high cure rate
	SAT2	Q27	I will choose this hospital again when I need a medical consultation.
	PLE1	Q28	I believe the staff at this hospital are competent, knowledgeable, updated, and skilled
	PIN16	Q29	The services provided to me at this hospital have high quality
	PIN14	Q30	I believe the medications prescribed to me at this hospital have good quality and efficacy

	PIN6	Q31	Postoperative bacterial infection is probable at this hospital
COMP-PI	PIN5	Q32	There is a probability of case referral to another hospital
	PIN4	Q33	There is a probability of case readmission at the same hospital
	PLE9	Q34	This hospital use technology to link my prescriptions and tests with the pharmacy and labs
TECH-PI	PLE10	Q35	This hospital use technology for saving my records
	PLE8	Q36	I believe this hospital uses the newest technology and devices for diagnosing and treating patients

Note: PATIENT-CENT-EXR, patient-centeredness, and care experience; INFO-EXR, information experience; PR-EXR, price experience; ACC-EXR, hospital accessibility experience; BUILCAP-EXR, building capacity experience; SERV-EXR, services experience; BUILENV-EXR, building environment experience; COMP-PI, complications perceived image; TECH-PI, technology perceived image; BSCP-ATTs, patient attitudes toward balanced scorecard perspectives.

The final resulted items in BSC-PATIENT validation- Arabic (sub-study 3)

رقم	تجربة المريض- اهتمام المستشفى بالمرضى واحتياجاتهم
1	يوزع هذا المستشفى استطلاعات لتقييم مدى الرضا قبل الخروج من المستشفى
2	توزع هذه المستشفى مسوحات لتقييم احتياجات المرضى عند الوصول إلى المستشفى أو الدخول أو أثناء الإقامة
3	يتابع هذا المستشفى حالتي بعد مغادرته
4	يتم أخذ شكاوى على محمل الجد في الاعتبار ويتم حلها على الفور في هذا المستشفى
5	دربني الموظفون على تدابير الوقاية من العدوى مثل نظافة اليدين، آداب السعال، الهدف من العزل، معدات الحماية الشخصية، إلخ..
رقم	تجربة المريض- السعر
6	أدفع سعراً مقبولاً للاستشارة الطبية
7	أدفع سعراً مقبولاً للخدمات الأخرى (المختبر، الأشعة، إلخ..)
8	أدفع سعراً مقبولاً للدواء
رقم	تجربة المريض- بيئة المبنى
9	يوجد عدد كافٍ من الكراسي في منطقة الانتظار
10	يحتوي المستشفى على أقسام نظيفة وممرات وغرف وحمامات
رقم	تجربة المريض- سعة المبنى
11	سعة المستشفى وحجم الأقسام مناسبة بما فيه الكفاية بما في ذلك (الطوارئ والعناية الحثيثة وغرفة الانتظار، إلخ..)
12	يوجد بالمستشفى بنية تحتية جديدة للمباني (حوائط، سقف، غرفة، حمامات، إلخ..)
رقم	تجربة المريض- الوصول للمستشفى
13	يسهل الوصول إلى موقع المستشفى بوسائل النقل العام أو للعثور على موقف لسيارتي
14	يسهل الوصول إلى موقع المستشفى في الحالات الطارئة
رقم	تجربة المريض- المعلومات
15	المعلومات والتوجيهات المقدمة للمرضى لاستخدامها بعد الخروج من المستشفى كافية (الأدوية والآثار الجانبية، الحالة الصحية، إلخ..)
16	المعلومات الشفوية والمكتوبة المقدمة للمرضى وعائلاتهم عن المرض أثناء تواجدهم في المستشفى كافية
17	المعلومات والتوجيهات المقدمة عند الدخول أو في الزيارة الأولى كافية
رقم	تجربة المريض- الخدمات
18	يتوافر طبيبات لعلاج الإنث في هذا المستشفى
19	هناك العديد من الأقسام في هذا المستشفى
20	تتوفر الخدمات الطبية في المساء والنوبات الليلية والعطلات في هذا المستشفى
21	يوجد العديد من التخصصات الطبية المتاحة في هذا المستشفى
رقم	توجهات المريض وتصورات- تقييم جوانب بطاقة الأداء المتوازن
22	سأقوم بإعطاء توصياتي الإيجابية لعائلتي وأصدقائي عن هذا المستشفى
23	أعتقد بأنني أتلقى فحص طبي دقيق في هذا المستشفى
24	أعتقد أن هذا المستشفى يقدم لي علاجاً أفضل من المستشفيات الفلسطينية الأخرى
25	مستوى رضائي الكلي عن هذا المستشفى عال
26	أعتقد أن هذا المستشفى لديه نسبة شفاء عالية
27	سأقوم باختيار هذا المستشفى مرة أخرى عندما أحتاج إلى مساعدة طبية
28	أعتقد أن موظفي هذا المستشفى أكفاء ومواكبين لأحدث المعلومات ومهرة
29	الخدمات المقدمة لي في المستشفى ذات جودة عالية
30	أعتقد أن الدواء الموصوف لي في هذا المستشفى له جودة وفعالية جيدة
رقم	توجهات المريض وتصورات- تقييم التعقيدات والمشاكل
31	أعتقد بأنه هناك احتمال لحدوث التهابات بكتيرية بعد العملية
32	أعتقد بأنه هناك احتمال لإعادة دخول المستشفى لنفس التشخيص
33	أعتقد بأنه هناك احتمال لتحويل الحالة المرضية إلى مستشفى آخر
رقم	توجهات المريض وتصورات- تقييم التكنولوجيا
34	يستخدم التكنولوجيا لربط وصفاتي واختباراتي بالصيدلة والمختبرات
35	يستخدم هذا المستشفى التكنولوجيا لحفظ سجلاتي
36	يستخدم هذا المستشفى أحدث التقنيات والأجهزة لتشخيص وعلاج المرضى

Appendix A9. The final resulted items in BSC-HCW1 validation-English (sub-study 4)

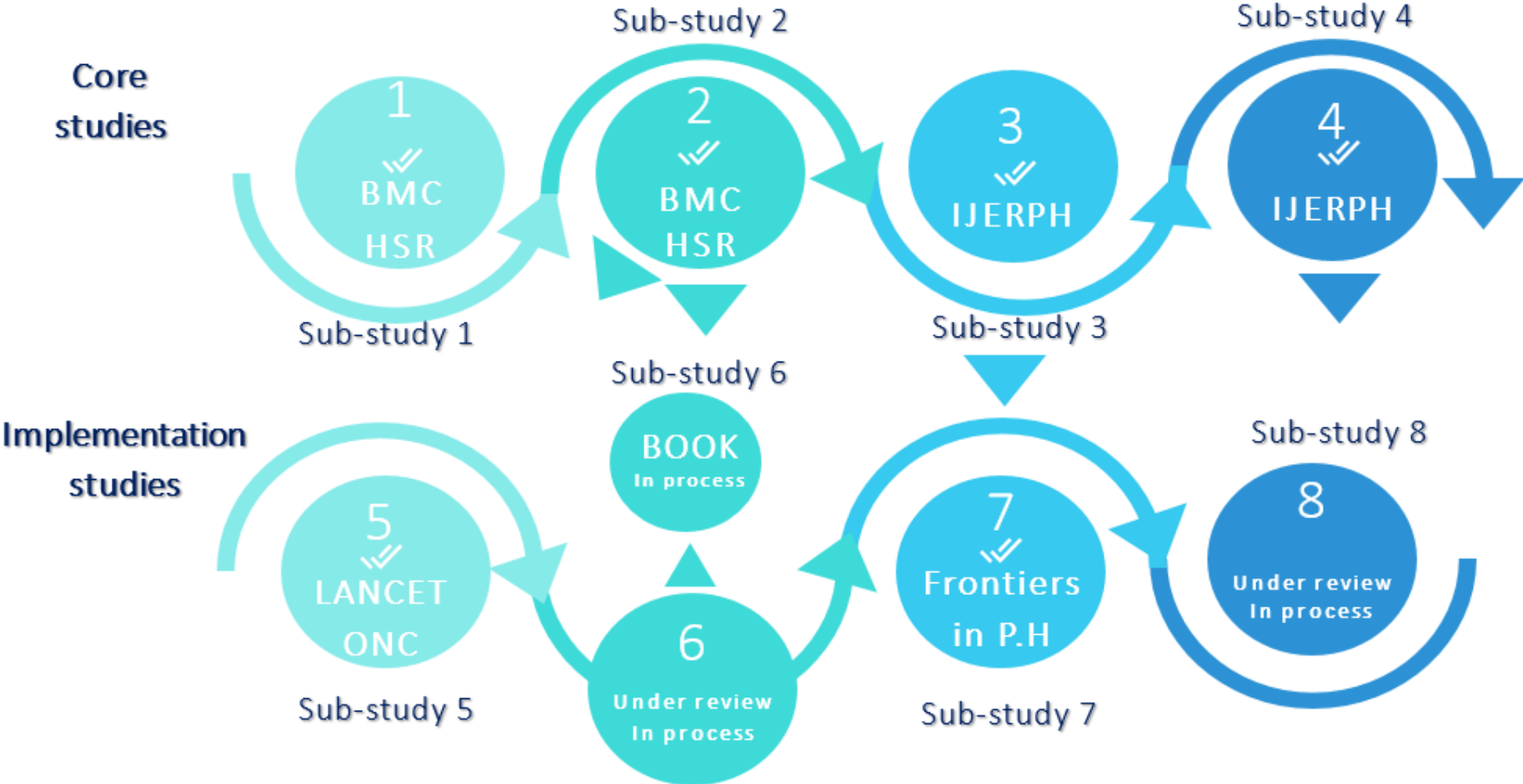
Construct	Code	No.	Question
FINI	ESF2	Q1	I receive financial incentives based on my performance
	ESF1	Q2	I feel that my salary suits my responsibilities and competencies
TECH	EST3	Q3	I believe that the hospital information system interface is user friendly
	EST5	Q4	I believe that the hospital information system and technology at this hospital make generating reports easier, faster, and more accurate
	EST1	Q5	This hospital has a technology/ information system
	EST6	Q6	I believe that the hospital information system and technology at this hospital make my work efficient and productive
WTLB	ESTI4	Q7	The quantity of work assigned to me is reasonable with the time given
	ESTI1	Q8	I have sufficient time to rest and eat during my working day
	ESTI3	Q9	I am able to make a work-life balance and a good time management
	ESTI2	Q10	I am able to spend sufficient time with each patient
QUALDEV	ESD3	Q11	The hospital provides me with education on medication updates that is related to my specialty
	ESD1	Q12	The hospital provides me with education updates regarding the diseases in my specialty
	ESQ2	Q13	The hospital medications and disposables are of high quality
	ESQ1	Q14	The hospital equipment helps me in offering high-quality medical services to patients
	ESQ3	Q15	Quality is a top priority at this hospital
HCW-ENG	ESMO5	Q16	My manager engages me in the planning and taking decision process
	ESMO6	Q17	I am given enough authority and power to make decisions in my position
	ESMO4	Q18	My manager understands and adequately supports me when I face an urgent hard situation
MANAG-PE	ESE2	Q19	My direct superiors explain and discuss the strengths and weaknesses in my assessment with me
	ESM2	Q20	I believe that my superiors are taking the right decisions at work which supports the hospital's strategy
	ESM1	Q21	I believe that my superiors have the required competencies for their positions
	ESE3	Q22	I believe that my assessment is fair and reflects my actual performance compared to your colleagues
MTR	ESC5	Q23	I trust what my direct manager tells or promises me with
PTR	ESR3	Q24	I believe that patients respect the healthcare workers at this hospital and trust them
LOY-ATTs	ESL3	Q25	I believe and feel that I want to keep working in this hospital for several years
	ESL5	Q26	I recommend this hospital to other colleagues or praise the hospital
	ESL4	Q27	I believe and feel that my overall satisfaction is high
	ESR4	Q28	I am proud to work with this hospital

Note: MANAG-PE, managerial tasks, and performance evaluation; HCW-ENG, health care workers' engagement; FINI, financial incentives; QUALDEV, quality and development; TECH, technology; WTLB, workload time-life balance; LOY-ATTs, loyalty attitude; MTR, managerial trust; PTR, patient respect toward health care workers.

Appendix A9. The final resulted items in BSC-HCW1 validation-Arabic (sub-study 4)

رقم	الحوافز المالية
1	أنتقي الحوافز المالية بناءً على مستوى أدائي
2	أشعر بأن راتبي يناسب كفاءاتي ومسؤولياتي
رقم	التكنولوجيا
3	أعتقد ان واجهة النظام المحوسب في هذا المستشفى سهلة الاستخدام
4	أعتقد ان النظام المحوسب في هذا المستشفى يجعل إعداد التقارير أسهل وأسرع وأكثر دقة
5	يوفر هذا المستشفى نظام تكنولوجيا معلومات محوسب
6	أعتقد ان النظام المحوسب في هذا المستشفى يجعل عملي فعالاً ومنتجاً
رقم	موازنة عبء العمل والحياة
7	كمية العمل المخصصة لي تتناسب مع الوقت المعطى لإنجازها
8	لدي الوقت الكافي للراحة وتناول الطعام خلال يوم عملي
9	أنا قادر على تحقيق التوازن بين حياتي الشخصية والعمل وعلى إدارة الوقت بشكل جيد
10	أعتقد انني أقضي وقتاً كافٍ مع كل مريض
رقم	الجودة والتطوير
11	يقدم لي المستشفى أحدث التعليمات بشأن تحديثات الأدوية المتعلقة بتخصصي
12	يقدم لي المستشفى أحدث التعليمات المتعلقة بالأمراض في مجال تخصص
13	الأدوية والمستلزمات الطبية المستعملة في هذا المستشفى ذات جودة وكفاءة عالية
14	معدات هذا المستشفى تساعدني على تقديم خدمات طبية عالية الجودة للمرضى
15	تعتبر الجودة الأولية القصوى بحسب سياسة هذا المستشفى
رقم	اشراك الموظفين
16	يعمل مديري على اشراكي في عملية التخطيط واتخاذ القرارات
17	يتم اعطائي السلطة والصلاحيات الكافية لاتخاذ القرارات في مواقف معينة
18	أعتقد ان مديري يفهمني ويدعمني بشكل كاف عندما أواجه وضعاً طارئاً صعباً
رقم	المهام الإدارية وتقييم الأداء
19	يشرح لي مدرائي المباشرون نقاط القوة والضعف في تقييمي ويناقشوها معي
20	أعتقد أن مدرائي في هذا المستشفى يتخذون القرارات الصحيحة في العمل والتي تدعم استراتيجيات المستشفى
21	أعتقد أن مدرائي في هذا المستشفى لديهم الكفاءات المطلوبة لمناصبهم
22	أعتقد ان تقييمي الوظيفي عادل ويعكس أدائي الفعلي مقارنة بزملائي
رقم	الثقة بالمدراء
23	أثق بما يخبرني به مديري المباشر أو بما يعدني
رقم	احترام المرضى للموظفين
24	أعتقد بان علاقتي بالمرضى جيدة ويوجد احترام متبادل بيننا
رقم	توجهات الموظفين- الولاء
25	أعتقد وأشعر أنني أريد الاستمرار في العمل في هذا المستشفى لسنوات عديدة
26	أوصي أو أشيد بهذا المستشفى لزملائي الآخرين
27	أعتقد وأشعر أن رضائي العام عن وظيفتي هذه عال
28	أشعر بالفخر للعمل في هذا المستشفى

Appendix A10. Summary of dissertation sub-studies and linkages (Eight sub-studies, six are published, total= IF: 75.938)



(Source: Own elaboration).

Appendix A11. IRB, PMOH and the participating hospitals' approvals.

An-Najah
National University
Health Faculty of medicine &
Sciences
IRB



جامعة النجاح
الوطنية
كلية الطب وعلوم الصحة
لجنة اخلاقيات البحث العلمي

Ref: Mas , May /20/16

IRB Approval Letter

Study Title:

“Strategic development of Palestinian hospitals using Balanced Scorecard (BSC) tool.”

Submitted by:
Faten Amer

Supervisor:
Abdulsalam Alkaiyat

Date Approved:
31st May 2020

Your Study Title “Strategic development of Palestinian hospitals using Balanced Scorecard (BSC) tool.” was reviewed by An-Najah National University IRB committee and was approved on 31st May 2020.

Hasan Fitjan, MD

IRB Committee Chairman
An-Najah National University



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ID number FI 58544

PÉCSI TUDOMÁNYEGYETEM

University of Pécs
Doctoral School of Health Sciences

Pécs, Hungary, 25 April 2021

Research Facilitating Request

Dear Istishari Arab Hospital managers,

The Doctoral School of Health Sciences (University of Pécs, Faculty of Health Sciences) is pleased to introduce **Ms. Faten Amer** who is a Ph.D. student of the University of Pécs (Pécs, Hungary). She is registered for the Ph.D. programme in the Doctoral School of Health Sciences, Faculty of Health Sciences in the Frontiers of Health Sciences Programme, under the supervision of Dr. Dóra Endrei PhD.

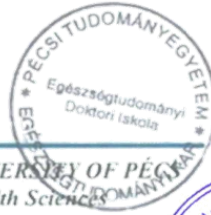
She intends to start his research entitled *“Using the Balanced Scorecard to strategically develop the Palestinian hospitals”* which has been scientifically reviewed and approved. Herein we would like to kindly request your kind contribution to facilitate her research and data collection at **Istishari Arab Hospital/ Ramallah.**

Hoping to have your generous permission we look forward to a successful cooperation.

Yours Sincerely,


Prof. Dr. SÜLYOK Endre MD, PhD, DSc
professor emeritus | *professor emeritus*

PÉCSI TUDOMÁNYEGYETEM | UNIVERSITY OF PÉCS
Egészségtudományi Kar | Faculty of Health Sciences
Egészségtudományi Doktori Iskola
Doctoral School of Health Sciences
H-7621 Pécs, Vörösmarty u. 4.
+36 72 513 678
www.etk.pte.hu





ID number FI 58544

PÉCSI TUDOMÁNYEGYETEM

*University of Pécs
Doctoral School of Health Sciences*

Her excellence,
The Palestinian Minister of Health
Dr. Mai al-Keileh

Pécs, Hungary, 4 May 2020

Research Facilitating Request

Your excellence,

I am Dr. Dóra Endrei, the direct supervisor for Faten Amer who is a Palestinian PhD student at the Doctoral School of Health Sciences, University of Pécs, Hungary. Her thesis topic is: Using the Balanced Scorecard to strategically develop the Palestinian hospitals.

First of all, we would like to eulogize the performance of the Palestinian Ministry of Health and the Palestinian health workers on their efforts in confronting the COVID-19 pandemic.

Ms. Amer's research aims to assess the performance indicators which are applicable and important for the Palestinian hospitals. It also aims at assessing the strengths and the weaknesses in the Palestinian hospitals. The results expected from this research project will not only help to understand the performance issues in the Palestinian hospitals but will also render recommendations to improve their performance.

The fieldwork (data collection) that Ms. Amer needs to do, comprises two parts. In the first part, a questionnaire will be distributed to the hospitals' managers. In the second part, the questionnaire will include hospitals staff and patients. The Palestinian Ministry of Health will be provided with a copy of the results and the recommendations of this research once available. The participants' privacy will be strictly guaranteed, and it will be impossible to link their personal identity to the research data. All public hospitals in the West Bank are included in this study and will be targeted with a fieldwork team led directly (or remotely) by Ms. Amer as she is still stuck in Hungary due to the restriction on movements because of COVID-19 Pandemic.

I have come to know Ms. Amer as a very conscientious, ambitious, thorough and resourceful PhD candidate. Being a Palestinian herself (with a B.Sc.in Pharmacy and MBA degree both obtained from An-Najah National university in Nablus), and several years of practical experience as a Marketing & Sales Manager at Sama Pharmaceuticals Manufacturing Co. (among many other multinational companies she worked with) in Palestine, she is exceptionally well equipped to carry out this dissertation study.

I urgently ask your cooperation to facilitate Ms. Amer's work in Palestine during the period of data collection at the Palestinian governmental hospitals.

Best Regards,

Dr. Dóra Endrei, PhD, MD, supervisor
Doctoral School of Health Sciences, Faculty of Health Sciences, University of Pécs, Pécs,
Hungary. Address: H-7621 Pécs, Vörösmarty u. 4.
E-mail: endrei.dora@pte.hu

H-7621 Pécs, Vörösmarty • u. 4.
Telefon/Fax: +36 (72) 513-678
e-mail: doktoriiskola@etk.pte.hu



Ref.:
Date:.....

الرقم: ٢٠٢١/٥
التاريخ: ٢٠٢١/١٠/١٤

الأخ مدير عام الإدارة العامة للمستشفيات المحترم ،،
الأخ مدير مجمع فلسطين الطبي المحترم،،،
تحية واحترام،،،

الموضوع: تسهيل مهمة بحث

لاحقاً لموافقة معالي وزيرة الصحة على التوصيات التالية حول البحث، يرجى تسهيل مهمة
الطالبة: فانت عامر، طالبة دكتوراه، جامعة University of Pécs في هنغاريا، لإجراء بحث
التخرج بعنوان: "Development of Palestinian Hospitals using Balanced Scorecard (BSC)"
حيث ستقوم الطالبة بجمع المعلومات عن طريق استبانة من المرضى والاطباء والاداريين، مع
العلم ان مشرف الدراسة د. عبد السلام الخياط بالشراكة مع مشرفين من جامعة Pecs/هنغاريا،
وذلك في:

- مستشفى رفيديا - مستشفى جنين - مستشفى طولكرم - مستشفى عاليه - مستشفى يطا
- مجمع فلسطين الطبي

على ان: - يتم الالتزام بجميع تعليمات واجراءات الوقاية والسلامة الصادرة عن وزارة الصحة
بخصوص جائحة كورونا، وتحت طائلة المسؤولية.

- وان يتم تزويدنا بنسخة حال الانتهاء من البحث.

- والالتزام بعدم النشر.

د. عبد الله القواسمي
رئيس وحدة التعليم الصحي والبحث العلمي
وزارة الصحة
د. عبد الله القواسمي
رئيس قسم الصحة العام
د. عبد الله القواسمي
رئيس وحدة التعليم الصحي والبحث العلمي
وزارة الصحة
الإدارة العامة للتعليم الصحي

نسخة: مشرف الدراسة المحترم/ جامعة النجاح

لانا نبح مع توزيح الاستمارات
وتسليم صيغة الجواب
صاحبه نبح
ع

المسيد حاتم النورياني المحترم

مدير عام مستشفى الهلال الأحمر الفلسطيني - الخليل.

تحية طبية وبعد،،،،

الموضوع: طلب الموافقة على اجراء بحث علمي في المستشفيات الفلسطينية

أهديكم اطيب التحيات، بداية لا يسعني الا أن أشكر كافة الطواقم الطبية والصحية على ما تقوم به من جهد وعمل ووصول للليل بالنهار في ظل هذه الجائحة المؤلمة على شعبنا خاصة والعالم عامة.
أما بعد أنا الصيدلانية فاتن عامر من مدينة نابلس طالبة دكتوراه في جامعة PCCS في هنغاريا، أرجو من حضرتكم التكرم بالموافقة على اجراء بحث علمي من خلال تجميع معلومات من المستشفيات كجزء من متطلبات رسالتي للدكتوراه في مجال ادارة العظوم الصحية، حيث يهدف البحث في الجزء الاول لمعرفة العوامل المستخدمة حالياً من قبل المستشفيات الفلسطينية في تقييم اداءها، كما يهدف في الجزء الثاني لتقييم المستشفيات الفلسطينية من خلال استخدام بطاقة الاداء المتوازن، والتي سُتستخدم للمرة الأولى في مستشفيات فلسطين بهذا الغرض، علماً بأن هذه الأداة تم استخدامها في المرة الأولى في أميركا في عام ١٩٩٦ في (Duke Children's Hospital)، وكنتيجه لهذا الاستخدام تمكن المستشفى من تحويل أربعة عشر مليون دولار خسائر الى أربعة ملايين دولار ارباح بعد سنة واحدة من الاستخدام، وعليه فقد قامت العديد من المستشفيات في مختلف دول العالم منذ ذلك الحين باستعمال هذه الأداة لتقييم اداءها وتطويره منها: مستشفيات في كندا والمانيا ومختلف دول العالم.

تتضمن الاداة تقييم ٤ جوانب وهي "الجانب المالي، جانب الاداء والكفاءة الداخلي، جانب الزبائن- المرضى والموظفين، جانب الابداع والتعلم"، سنقوم بتوزيع استمارات في المرحلة الاولى لادارة المستشفى، كما سيتم في المرحلة الثانية توزيع استمارات على موظفي المستشفى والمرضى.

لذلك نرجو منكم التكرم بالموافقة على الاتي:

١. توزيع ٤ أنواع من الاستبيانات في هذا المستشفى (استبيان الادارة العليا لتقييم المستشفى، استبيان الموظفين لتقييم المستشفى، استبيان قياس رضا الموظفين، استبيان قياس رضا المرضى)
 ٢. الحصول على التقرير المالي لعام ٢٠١٩ وتقرير ٢٠٢٠ عند صدوره.
- كما نتعهد بالمحافظة على خصوصية المعلومات وسريتها للمستشفيات وللموظفين والمرضى، حيث انه لن يتم التطرق لاسماءهم في البحث، وسيتم استعمال المعلومات والاجابات لأغراض البحث العلمي فقط من أجل استكمال رسالة الدكتوراه.

وتفضلوا بقبول فائق الاحترام والتقدير،،،،

فاتن عامر

للتواصل 0036703669884

amer.faten@pccs.plo.hu

السيد الدكتور يوسف التكروري المحترم

مدير عام المستشفى الأهلي

تحية طيبة وبعد،،،

الموضوع: طلب الموافقة على اجراء بحث علمي في المستشفيات الفلسطينية

أهديكم اطيب التحيات، بداية لا يسعني الا أن أتشكر كافة الطواقم الطبية والصحية على ما تقوم به من جهد وعمل ووصول لليل بالنهار في ظل هذه الجائحة المولمة على شعبنا خاصة والعالم عامة.
أما بعد أنا الصيدلانية فاتن عامر من مدينة نابلس طالبة دكتوراه في جامعة Pécs في هنغاريا، أرجو من حضرتكم التكرم بالموافقة على اجراء بحث علمي من خلال تجميع معلومات من المستشفيات كجزء من متطلبات رسالتي للدكتوراه في مجال ادارة العلوم الصحية، حيث يهدف البحث في الجزء الاول لمعرفة العوامل المستخدمة حالياً من قبل المستشفيات الفلسطينية في تقييم اداءها، كما يهدف في الجزء الثاني لتقييم المستشفيات الفلسطينية من خلال استخدام بطاقة الأداء المتوازن، والتي سُتستخدم للمرة الاولى في مستشفيات فلسطين بهذا الغرض، علماً بأن هذه الأداة تم استخدامها في المرة الأولى في أميركا في عام 1996 في (Duke Children's Hospital)، وكنتيجه لهذا الاستخدام تمكن المستشفى من تحويل أربعة عشر مليون دولار خسائر الى أربعة ملايين دولار ارباح بعد سنة واحدة من الاستخدام، وعليه فقد قامت العديد من المستشفيات في مختلف دول العالم منذ ذلك الحين باستعمال هذه الأداة لتقييم اداءها وتطويره منها: مستشفيات في كندا والمانيا ومختلف دول العالم.

تتضمن الاداة تقييم 4 جوانب وهي "الجانب المالي، جانب الاداء والكفاءة الداخلي، جانب الزبائن- المرضى والموظفين، جانب الابداع والتعلم"، سنقوم بتوزيع استمارات في المرحلة الاولى لادارة المستشفى، كما سيتم في المرحلة الثانية توزيع استمارات على موظفي المستشفى والمرضى.
لذلك نرجو منكم التكرم بالموافقة على الاتي:

1. توزيع 4 أنواع من الاستبيانات في هذا المستشفى (استبيان الادارة العليا لتقييم المستشفى، استبيان الموظفين لتقييم المستشفى، استبيان قياس رضا الموظفين، استبيان قياس رضا المرضى)
 2. الحصول على التقرير المالي لعام 2019 وتقرير 2020 عند صدوره.
- كما نتعهد بالمحافظة على خصوصية المعلومات وسريتها للمستشفيات وللموظفين وللمرضى، حيث انه لن يتم التطرق لاسماءهم في البحث، وسيتم استعمال المعلومات والاجابات لأغراض البحث العلمي فقط من أجل إستكمال رسالة الدكتوراه.

وتفضلوا بقبول فائق الاحترام والتقدير،،،،

فاتن عامر

للتواصل 0036703669884

amer.faten@etk.pte.hu



Ref. No.: _____

رقم الشارة: 65/1/3

Date: _____

التاريخ: 28 نيسان 2021

حضرة الدكتور عبد السلام الخياط المحترم

مشرف البحث

جامعة النجاح الوطنية

تحية طيبة وبعد ،

الموضوع: تسهيل مهمة بحثية

بالإشارة إلى كتابكم المؤرخ 2021/4/4 والذي تطلبون فيه تسهيل مهمة بحث بعنوان:

"Strategic Development of Palestinian Hospital using the BSC tool" لطالبة الدكتوراة الصيدلانية فاتن

عامر، فإنه لا مانع لدينا من حيث تسهيل مهمتها على أن يتم تزويد مكتب الإدارة بنتائج البحث، بالإضافة لعدم

نشر البحث إلا بموافقة من إدارة المستشفى.

وتفضلوا بقبول فائق الإحترام،،،

الدكتور عدنان فرهود

المدير العام

عبدالله فرهود

AC



مركز البحث العلمي السريري
Clinical Research Centre



August 8, 2021

Ref: PAug2

Subject: Permission for conducting research

Dear Miss Amer Faten

The purpose of this letter is to inform you that I give "*Amer Faten*" permission to conduct the research titled "*Strategic Development of Palestinian Hospitals Using Balanced Scorecard*" at An-Najah National University Hospital. This also serves as an assurance that your research should comply with the requirements of the hospital ethical issues in all research processing.

We wish you all the best in your research efforts.

Sincerely,

Sa'ed H. Zyoud

Ph.D., Clinical Toxicology

Director of Clinical Research Center



From: ALBAIK, Shatha <S.ALBAIK@unrwa.org>
To: QARMASH, Adnan <A.QARMASH@unrwa.org>, ZIED, Khalidun <K.ZIED@unrwa.org>, WOHOUSH, Mahmoud <M.Wohoosh@unrwa.org>, EISSA, Najwa <N.Issa2@unrwa.org>, amer.faten@etk.pte.hu <amer.faten@etk.pte.hu>, HORINO, Masako <M.HORINO@unrwa.org>, PAOLUCCI, Gloria <G.PAOLUCCI@unrwa.org>
Cc: WOHOUSH, Mahmoud <M.Wohoosh@unrwa.org>, EISSA, Najwa <N.Issa2@unrwa.org>, amer.faten@etk.pte.hu <amer.faten@etk.pte.hu>, HORINO, Masako <M.HORINO@unrwa.org>, PAOLUCCI, Gloria <G.PAOLUCCI@unrwa.org>
Date: Tuesday, May 18, 2021, 11:00 AM +0200
Subject: RE: Data Collection Approval

Dear Dr Adnan and Dr Khalidun,

Eid Mubarak , and our full support and prayers are with you at this challenging time.

This is to inform you that the study proposal by PhD student ,Faten (cced) titled "Strategic Development of Palestinian Hospitals Using Balanced Scorecard " has been **Approved** by the agency's RRB

Your support and facilitation of the study implementation is highly appreciated

Regards



shatha albeik | public health coordinator

unrwa | health department | hq amman

t: +962 6 5808 463 | f: +962 6 5808 319 | m: +962 79 6986852 | e: s.albaik@unrwa.org

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Ref.:
Date:.....

الرقم: ٢٠٢١/٥١٠
التاريخ: ٢٠٢١/١١/٠٤

الأخ مدير عام الإدارة العامة للمستشفيات المحترم ،،
الأخ مدير مجمع فلسطين الطبي المحترم،،،
تحية واحترام،،،

الموضوع: تسهيل مهمة بحث

لاحقاً لموافقة معالي وزيرة الصحة على التوصيات التالية حول البحث، يرجى تسهيل مهمة
الطالبة: فاتن عامر، طالبة دكتوراه، جامعة University of Pécs في هنغاريا، لإجراء بحث
التخرج بعنوان: " Development of Palestinian Hospitals using Balanced Scorecard (BSC) "
حيث ستقوم الطالبة بجمع المعلومات عن طريق استبانته من المرضى والاطباء والاداريين، مع
العلم ان مشرف الدراسة د. عبد السلام الخياط بالشراكة مع مشرفين من جامعة Pecs/هنغاريا،
وذلك في:

- مستشفى رفيديا - مستشفى جنين - مستشفى طولكرم - مستشفى عاليه - مستشفى يطا
- مجمع فلسطين الطبي

على ان: - يتم الالتزام بجميع تعليمات واجراءات الوقاية والسلامة الصادرة عن وزارة الصحة
بخصوص جائحة كورونا، وتحت طائلة المسؤولية.

- وان يتم تزويدنا بنسخة حال الانتهاء من البحث.
- والالتزام بعدم النشر.

د. عبد الله القواسمي
رئيس وحدة التعليم الصحي والبحث العلمي



نسخة: مشرف الدراسة المحترم/ جامعة النجاح



S-HESRU / Sent: 8/12/2022/377

Appreciation Certificate

The President of the First National Conference on Health Research extends his thanks to **Mrs. Faten Amer** for her participation in the conference, December 5, 2022 in Palestine, by presenting a poster presentation for her distinguished research on health policies, which won the presentation award.

Dr. Abdalla Kawasme



Chairman of the First National Health Research Conference 2022
Director of Health Education and Scientific Research/ Palestinian
Ministry of Health

Submission of the doctoral dissertation and declaration of the originality of the dissertation

The undersigned,

Name: **Faten**

Maiden name: **Amer Abdel Latif Amer**

Mother's maiden name: **Ra'eda Diab**

Place and time of birth: **Nablus, 30 August 1986**

on this day submitted my doctoral dissertation entitled:

The Deployment of Balanced Scorecard Perspectives and Dimensions to Improve Hospitals' Performance

PR-1 , **Frontiers of Health Sciences** Programme

of the Doctoral School of Health Sciences, Faculty of Health Sciences, University of Pécs.

Names of the supervisor(s):

Dr Dóra Endrei

Prof. Dr. Imre Boncz

At the same time, I declare that

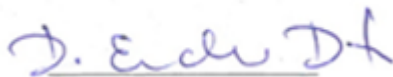
- I have not submitted my doctoral dissertation to any other Doctoral School (neither in this country nor abroad),
- my application for degree earning has not been rejected in the past two years,
- in the past two years I have not had unsuccessful doctoral procedures,
- my doctoral degree has not been withdrawn in the past five years,
- my dissertation is independent work, I have not presented others' intellectual work as mine, the references are definite and full, on preparation of the dissertation I have not used false or falsified data.

Furthermore, I declare that I contribute to the request of DOI identification of my doctoral dissertation.

Dated: 24 Jan 2023



signed by Candidate



Supervisor



Co-supervisor