An Analysis of Aptness and Comfort in Healthcare Units and Patient Safety in the Scope of Occupational Health and Safety



Teresa Lajinha and Miguel Tato Diogo

Abstract Through data collected from the Portuguese National System of Health Quality Assessment (SINAS) for the dimensions Patient Safety and Aptness and Comfort in Healthcare Units a comparison was established between quality evaluation issues in Portuguese healthcare units and how these issues could affect healthcare workers' health and safety, at the same time is presented a methodology that enables to rank healthcare units for the dimension Patient Safety. The methodology proposed shows that, globally, the units need to improve their marks in that dimension. The main adverse events responsible for poor outcomes regarding Patient Safety are also presented. The work done points out a misty relation between the two quality dimensions assessed, showing the need of clearing some aspects related with the evaluation of the dimension Aptness and Comfort in Healthcare Units, though it was found that the most critical events related with healthcare workers' health and safety issues are linked with surgical processes.

Keywords Healthcare units · Health and safety · Quality

1 Introduction

Human errors and adverse events were pointed out as the main factors in patient safety in the last years. Organizational factors like fatigue and sleepiness in healthcare units affect patient safety [1]. The inverse relation is also true. Deficiencies in patient safety results also have a negative impact on healthcare

T. Lajinha (✉) · M. T. Diogo (✉)
CERENA – Centro de Recursos Naturais e Ambiente (Pólo-FEUP), Faculdade de Engenharia da Universidade do Porto, Porto, Portugal
e-mail: tlajinha1@gmail.com

M. T. Diogo
e-mail: tatodiogo@fe.up.pt

T. Lajinha
Universidade Fernando Pessoa, Porto, Portugal

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workers. Work management, physical work environment, and the quality of health care services have effects on workers' performance, attitudes, job satisfaction, and health and well-being [2–4]. Accordingly to some researchers, healthcare systems must deviate from a "blame and shame" culture to a paradigm that facilitates learning from error [5]. The design of the healthcare system can impact patients and employees. Healthcare workers suffer several consequences from poor system design, such as job dissatisfaction, burnout, intentions to quit, reduced mental health, and injuries [6]. Healthcare workers' perception of being overwhelmed is a consequence of the number of emergency admissions, deaths on the ward and load of tasks performed. Risks of healthcare workers occupationally acquired infections from several fonts of exposure are object of many studies, and there are studies about the relationship between incidents like absenteeism, back injuries and needlestick, and patient incidents [2]. Research already developed in the area of patient safety, in particular, and in healthcare units' quality, in general, doesn't link those aspects to those related to health and safety in the healthcare sector.

The present work searches the relation between quality evaluation issues in healthcare systems in Portugal and how those issues are related to healthcare workers' health and safety. It is also presented a methodology that enables finding the main adverse events responsible for poor quality in patient safety outcomes and designing a scale to rank each healthcare unit for patient safety.

2 Data and Methodology

In Portugal, the promotion of an evaluation system for the global classification of healthcare units is done by the Portuguese Healthcare Regulation Authority (Entidade Reguladora da Saúde—ERS). The National System of Health Quality Assessment (Sistema Nacional de Avaliação em Saúde—SINAS) is a system created by the ERS which aims to assess health care providers in terms of global quality of services [7]. The dimensions of quality evaluate by this system are: Clinical Excellence, Patient Safety, Aptness and Comfort in Healthcare Units; Emphasis on the User and User Satisfaction [8]. Each healthcare unit is liable for the information provided, with periodically audition exerted by ERS.

In the scope of this work, data were collected from the SINAS@Hospitais web page (https://www.sns.gov.pt/home/sistema-nacional-de-avaliacao-em-saude-sinas/) regarding the dimensions Patient Safety [dimPatSafe] and Aptness and Comfort in Healthcare Units [dimACHU]

The evaluation process in the dimPatSafe is carried out by assessing adverse events through a set of indicators that reveal their evidence. The indicators are: Death in Low Mortality Diagnosis Related Groups; Pressure Ulcers from Stage III and IV; Nosocomial Infection (infection that is associated to central catheter insertion); Hip Fracture in post-surgical procedure; Haemorrhage or Hematoma in post chirurgical procedures with necessity of re-exploration; Nosocomial Infection (post-surgical sepsis); Wound Dehiscence and Perforation or Accidental Laceration [8].

The analysis of the global level of quality in these indicators (on a scale from I to III and for all the healthcare units that submit information) will make it possible to select those indicators which are more critical and to advise their consequences in health and safety of healthcare workers. Furthermore, each healthcare unit can get a ranking of quality (from I to III) in the dimPatSafe based on the individual level of quality of the referred indicators.

The dimension Aptness and Comfort is evaluated by SINAS through a check-list submitted online by each healthcare unit and under their responsibility. In the framework of Aptness, the check-list evaluates passageways and mobility; maintenance (equipment, flow nets, residuals management); fire safety auto protection measures, no clinical risks (entrances and departures control, surveillance and warnings). In the scope of Comfort are evaluated the internment areas, complementary zones (coffee shop, restaurants, toilets), thermic, acoustic and visual comfort, water and indoor air quality [8]. The subjects related to safety and hygiene at work are evaluated in this dimension, which is ranked by SINAS on a scale from I to III, based on a ratio of achievement of the requirements. In this dimension is only released a global ranking. There is not a public disclosure of the individual requirements just mentioned.

From the site SINAS@Hospitais, data were retrieved in the dimensions already referred that were submitted in the last evaluation process by 45 public Health Facilities with the status of EPE (Entidade Pública Empresarial—Public Enterprise). Only the units with answers in all the indicators of the dimPatSafe and with rating in the dimension Aptness and Comfort in Healthcare Units were studied. For those units, a database was constructed for the quality evaluation level (from I to III) in each of the eight indicators of the dimPatSafe and with the global evaluation level (also from I to III) in the dimACHU.

In a second stage, and for each indicator of the dimPatSafe, it was computed a ratio of quality (Quality Degree Ranking—QDR) that enables to measure the degree of quality in a parameter for all the healthcare units. This ratio of quality was obtained dividing the sum of the number of quality level found for the indicator, and for all the units, by the maximum quality level that the indicator might get (if all the units were evaluated with III). Thus, the degree of quality varies from 0 to 1, making it possible to rank the indicators in the dimPatSafe from the worst outcomes to excellent outcomes. However, this degree of quality by itself doesn't manage to detect smear deficiencies that can be revealed, for example, by parameters evaluated only with a quality level of two by all Health Facilities. Therefore, five criteria were used in the selection of critical indicators (or adverse effects), as those that can have a greater impact in Patient Safety issues in healthcare units as a whole: quality degree ranking, mode equal to I or II, more than 50% of ones and none three in global evaluation.

Since SINAS classification is for the individual adverse effects in each Health Facility and not for the full Patient Safety dimension, in a third stage, it was computed a QDR for each of the 45 evaluated Health Facilities and each one was evaluated from I to III in the dimPatSafe using the accumulated QDR value (ordered in a percentile scale) and the values of the mode and the mean computed with the evaluation levels of the indicators relative to Patient Safety got in SINAS.

In the last stage it was tried to establish a relationship between the rankings obtain for each Health Facility in the dimPatSafe and the dimACHU and, at the same time, identify the critical indicators (adverse events) in the dimPatSafe that, as a whole, are responsible for a poor evaluation in that dimension, with negative implications in healthcare workers' health and safety.

3 Results

Table 1 presents the results of the Quality Degree Ranking (QDR), modes, and number of I, II and III in the global evaluation of the 45 Health Facilities for the eight indicators included in the dimPatSafe.

As it can be observed in Table 1, the indicator with the worst result is Wound Dehiscence. Attending to the defined criteria to highlight and grade the most critical indicators concerning patient safety, the adverse conditions with a higher level of deficit in terms of quality evaluation (QDR < 50%), in an ordered form are: (i) Wound Dehiscence; (ii) Haemorrhage or hematoma in post-surgical procedures with necessity of re-exploration; (iii) Death in Low Mortality Diagnosis Related Groups (DRG); (iv) Nosocomial Infection (post-surgical sepsis); (v) Hip Fracture in post-surgical procedure.

Excluding "Death in Low Mortality Diagnosis Groups" these indicators are in their majority linked to surgical process.

Wound Dehiscence presents a mechanical failure of wound healing of surgical incisions. One of the causes of Wound Dehiscence is infection [9].

Diagnosis related groups are a system of classification of hospitalized patients that group patients in clinically coherent groups. Among these groups are defined

Table 1 Quality degree ranking and other statistics for adverse events

Adverse events	QDR	Mode	Counts of level I	Counts of level II	Counts of level III
Death in low mortality diagnosis related groups	0.43	I	33	13	0
Pressure ulcers from stage III and IV	0.98	III	1	1	44
Nosocomial infection (infection that is associated to central catheter)	0.98	III	0	3	43
Hip fracture in post chirurgical procedure	0.67	II	0	45	0
Haemorrhage or hematoma in post chirurgical procedures with necessity of re-exploration	0.39	I	38	7	0
Nosocomial infection (post chirurgical sepsis)	0.47	I	27	18	0
Wound dehiscence	0.33	I	45	0	0
Perforation or accidental laceration	0.99	III	0	1	45

conditions with a low mortality incidence, less than 0.5%, that are codified in a system of about 220 codes. These conditions have great variability, from bronchitis and asthma to syncope and collapse [10, 11]. A poor evaluation in this indicator is somewhat critical as it could point a noticeable number of misdiagnosis events.

Nosocomial Infections are ranked in fourth place (QDR ratio equal to 0.47). These are hospital-acquired infections that occur within 48 h of hospital admission, three days of discharge or 30 days of an operation. On average, a hospital-acquired infection results in patients staying 2.5 times longer in hospital. Gram-positive antibiotic-resistant bacteria are the more common cause of Nosocomial Infections [12].

In accordance to some authors, the strongest links between patient and worker health consequences are found in nosocomial transmission of infections via health care worker-related incidents (lack of handwashing, lapses in aseptic protocols). It was also found a strong relationship between the degree of stress and the occurrence of patient incidents, perhaps responsible for misdiagnosis events [2, 4]. Patients' Hip Fracture in post-surgical procedure increases the risk of worker lower back injuries and healthcare worker risk of infection and needlestick injury can be enhanced by Wound Dehiscence occurrences. Globally, as the majority of adverse events are linked to surgical practices, risk factors related to poor outcomes in patient safety that could be expected are infections and cuts.

Table 2 presents the evaluation (from I to III) computed for each of the 45 studied Health Facilities (comprehending: CH—Regional Health Centre, H—Central

Table 2 Evaluation of the dimensions patient safety and aptness and comfort in healthcare units for each healthcare facility

Healthcare facility	Mean	Mode	QDR	dimPatSafe Ranking	dimACHU Ranking
CH 1	2	I	0.667	I	II
CH 2	1.875	I	0.625	I	II
CH 3	1.875	I	0.625	I	III
CH 4	1.875	I	0.625	I	III
CH 5	2	I	0.667	I	III
CH 6	2	III	0.667	II	II
CH 7	2	III	0.667	II	II
CH 8	2	I	0.667	I	II
CH 9	1.875	I	0.625	I	III
CH 10	2	III	0.667	II	III
CH 11	2.125	III	0.708	III	II
CH 12	2.125	III	0.708	III	II
CH 13	2	III	0.667	II	III
CH 14	1.875	I	0.625	I	III
CH 15	1.875	I	0.625	I	III
CH 16	1.875	I	0.625	I	III

(continued)

Table 2 (continued)

Healthcare facility	Mean	Mode	QDR	dimPatSafe Ranking	dimACHU Ranking
CH 17	2	I	0.667	I	II
CH 18	1.75	II	0.583	I	III
CH 19	1.875	I	0.625	I	III
CH 20	1.875	I	0.625	I	III
CH 21	1.875	I	0.625	I	III
CH 22	1.875	I	0.625	I	III
CH 23	1.875	I	0.625	I	III
CH 24	1.875	I	0.625	I	III
CH 25	1.875	I	0.625	I	III
CH 26	2	III	0.667	II	III
CH 27	2	III	0.667	II	III
CH 28	1.875	I	0.625	I	II
CH 29	1.875	I	0.625	I	II
CH 30	1.875	I	0.625	I	II
H 1	2	I	0.667	I	III
H 2	2.125	II	0.708	III	III
H 3	2	I	0.667	I	III
H 4	1.875	I	0.625	I	III
IPO 1	2	II	0.667	II	III
IPO 2	1.875	II	0.625	I	III
IPO 3	1.875	II	0.625	I	III
ULS 1	2	I	0.667	I	III
ULS 2	2.25	II	0.75	III	III
ULS 3	2	I	0.667	I	I
ULS 4	2	I	0.667	I	I
ULS 5	2	II	0.667	II	III
ULS 6	2.125	III	0.708	III	III
ULS 7	2.125	III	0.708	III	III
ULS 8	2.125	III	0.708	III	III

Hospital, IPO—Portuguese Oncology Institute, ULS—Local Health Unit) in the dimPatSafe, using the mentioned methodology, as well as the mode and the mean of the evaluated indicators in each Health Facility and the rankings retrieve from SINAS for the dimACHU. The names of the Healthcare Facilities were omitted.

Among the 45 Healthcare Facilities studied and using the multi-criteria methodology proposed, 7 of them (15.6%) have an evaluation of III in the dimPatSafe and the majority of the studied Facilities (66.7%) has a poor evaluation (level I) in that dimension.

The correlation coefficient computed for dimPatSafe and dimACHU evaluation levels in Table 2 has a value of 0.07, meaning that it cannot be established a relationship between the rankings of those quality dimensions.

Examining the ranking values for dimACHU, it can be state that the majority (71.1%) of the studied Health Facilities has a ranking of III, meaning that the evaluation introduced by most Health Facilities in SINAS for this dimension is with intuit of fulfilling conformity in the respective evaluated indicators, where healthcare workers safety is included.

Whereas the majority of Health Facilities has poor outcomes in dimPatSafe they have good outcomes in dimACHU. This result is somewhat unexpected taking into account that the relationship between workers' safety and patient's safety results may be bidirectional [4]. However, he global nature of rankings disclosure in dimACHU doesn't show the individual evaluation for each of the involved parameters, namely, passageways and mobility, auto protection measures, complementary zones and thermic, acoustic and visual comfort, that may specifically lead to poor outcomes in dimPatSafe.

4 Final Remarks

The evaluation process of the Healthcare Facilities was carried out only in those units where information exists in the Diagnosis Related Groups Data Base, given by the Portuguese Health System Central Administration—Health Ministry (ACSS—Administração Central do Sistema de Saúde). ACSS provides anonymous data from exploration, omitting administrative data that enable the identification of the patient. Thus, the results obtained in ranking critical parameters related with patient safety don´t consider biographical data like age, gender, or primary health conditions, which could affect the ranked outcomes. However, adverse events like Wound Dehiscence and Hip Fracture can be connected with the age of the patient. Aged people are more prone to some sort of health conditions. Death in Low Mortality Diagnosis Related Groups is linked with a great diversity of medical conditions, and so, their consequences in healthcare workers' health and safety are much vague. Overall, the occurrence of critical adverse events parameters doesn't create new conditions for workers' health and safety besides those that are already known in healthcare sector, but they harsh some of them. To improve the study of the relationship between patient safety outcomes and healthcare workers' occupational risks, it would be necessary to construct and apply a survey to verify the consequences on workers of adverse events (that could be considered secondary injuries within the healthcare system) in the scope of patient safety.

Considering the evaluation of the dimPatSafe in each Health Facility according to the proposed methodology it may be referred that for the same QDR evaluation (0.667) there are some Health Facilities with mean II and mode I in the evaluation of adverse events and some Health Facilities with mean II and mode II or III in the evaluation of adverse events. For the first group, the evaluation level attributed was

I, while for the second group the assigned level was II. These criteria produced a greater number of I than of II (underrated) that could, somehow, also explain the lack of numerical relation between the evaluated dimPatSafe and dimACHU ranked by SINAS. Other possible explanation for the lack of numerical relation between the two above mentioned dimensions could be related with the way in which the factors involved in the last dimension are evaluated and perceive in the check-list (overvalued). As a matter of fact validation of evaluation constructs is a challenging subject.

As referred, and summing up, Patient Safety indicators with poor evaluation are related to surgical practices. Wound Dehiscence has the worst result, followed by Haemorrhage or Hematoma in post-surgical procedures with necessity of re-exploration and Mortality in DRG. Risks for healthcare workers related to poor results in those adverse events are infections. Surgical practices, treatment of wounds and contact with blood are the main activities that have a negative impact on healthcare workers' health and safety. Mortality in DRG can improve the degree of healthcare workers' stress. The majority of the Healthcare Facilities evaluated in this work (66.7%) has a poor outcome for the dimPatSafe (level I), having a great number of adverse events weakly evaluated. These last results are not directly related with the rankings in the dimACHU, because for this dimension, that includes subjects as maintenance and physical comfort, linked with workers' safety, the majority of the studied healthcare units have a ranking of III. Apparently, there is no relation between the adverse events in the dimension Patient Safety and the accomplishment of the items related with the dimension Aptness and Comfort in Healthcare Facilities. This result needs to be re-explored to know more details about the way in which the different facilities evaluate this last dimension. While events related with Patient Safety are well documented in ACSS, matters related with Units Aptness and Comfort have a more subjective evaluation, that vary with organizations safety culture and respondent perception, being an issue that requires further development and validation.

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