Experience of Healthcare Workers in Saudi Health Organizations with Bloodborne Pathogen Post-Exposure Management

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KEYWORDS

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Background: Effective measures to avoid occupational injuries are necessary to establish a safety culture in any healthcare facility. For planning and development reasons, it is advised to establish a baseline evaluation of these metrics. Using an adaptation of the Disease Control and Prevention (CDC) sharps injury prevention workbook, the current study assessed healthcare workers' perceptions of a safety culture and sharps injury prevention in their healthcare facilities.

Methods: 397 healthcare professionals who met the inclusion requirements using a non-probability sample approach completed and submitted electronic self-administered questionnaires as part of a cross-sectional study.

Results: Healthcare professionals from the four Saudi health sectors had a generally favorable opinion of the safety culture and the prevention of sharps injuries. Nonetheless, over one-third of them acknowledged having at least one exposure to blood or bodily fluids at work (26 percent had a needle stick injury, and 33 percent had a mucocutaneous exposure). Additionally, a third of the exposed workers indicated that their health institutions' post-exposure management was inadequate. The poor perception scores ($p < 0.001$) of the individuals from private institutions were rather unexpected.

Conclusion: The study's participants had positive perception about their health institutions' safety cultures and efforts to avoid injuries from sharp objects. The study's findings suggest that, to improve the culture of safety, healthcare workers' perceptions of leadership support should be represented and addressed through regular evaluation.

1. Introduction

Needle sticks and other sharps injuries can expose workers to bloodborne infections, an avoidable workplace hazard. Healthcare workers' (HCWs') highest risk of occupational infections is hepatitis B, hepatitis C viruses, and human immunodeficiency virus (HIV) [1]. According to WHO estimates, needle-stick injuries are responsible for 37%, 39%, and 4.4% of hepatitis B, hepatitis C, and HIV infections, respectively [2]. Occupational risks to healthcare workers have received more public attention in recent years than they received forty years ago. Numerous researches looked at the prevalence of sharps and needle-stick injuries (NSSI). In the US, there were 30 NSSI for every 100 beds annually [3], while in the UK, there were 100,000 NSSI annually [4]. NSSI was 33 per 1000 healthcare providers in a prospective study in a tertiary center in Saudi Arabia [5].

Providing a safe environment is seen as one of the rights of patients and healthcare professionals. Regulatory bodies have traditionally methodically reviewed and tracked the need to address hazard prevention in healthcare facilities at the national level. Thus, applying various risk-management techniques (HCWs), such as engineering safeguards of needle devices and administrative measures, decreased exposure occurrences, such as needle sticks and the ensuing infection in healthcare personnel [6,7]. Although many researchers have noted a significant number of underreported events of needle-stick and sharps-related injury [8], needle-stick injuries and other exposures still occur, and there is growing concern about the high level of anxiety following exposure and the possible impact of psychological complications on the productivity and quality of work of healthcare workers [7,8]. Long-standing habits are hard to change, and despite all the pre-exposure measures, occupational injuries will still occur. However, post-exposure care is believed to be an essential and complementary component of the overall preventative approach [1]. It involves assessing the risk of transmission using a thorough medical history and laboratory tests and, if necessary, promptly administering the proper post-exposure prophylaxis (PEP). Healthcare practitioners should get training on reporting occupational injuries immediately since this is the first logical step in initiating the post-exposure treatment process. This is because the value of preventative treatments lies in the early stages of damage [9]. However, concerns exist regarding healthcare personnel's adherence to the pre-and post-exposure guidelines. The clinical effects of occupational exposure among healthcare workers, the reporting rate, and the degree of understanding of these guidelines among HCWs have been the focus of several research conducted in Saudi Arabia [10,11]. A sharps injury prevention program's core components include developing a safety culture, documenting injuries, analyzing data, and choosing and assessing devices. A baseline evaluation of these procedures is necessary for health institutions to design and develop their programs [9] effectively. For improvement, the current study sought to assist healthcare institutions in measuring how their staff perceive safety culture and the avoidance of sharps injuries.

Study Objective

The study's primary (specific) objective was to investigate how healthcare staff perceive a culture of safety along with sharps injury prevention in their healthcare institutions using the modified survey of the Disease Control and Prevention (CDC) sharps injury prevention workbook. The study sought to evaluate the operational procedures of occupational health programs in Saudi healthcare institutions from the perspective of the safety culture and sharps injury prevention.

2. Methods

3.1 Study setting

This research was conducted in Saudi Arabia. The country's healthcare system serves over 30 million Saudi citizens and residents and several million tourists who come to do the Hajj and Umrah. Medical cities, specialty hospitals, college and military hospitals, and primary care facilities are some of the healthcare sectors that offer these services. The electronic

questionnaire disseminated on Facebook, WhatsApp, and Twitter—the three social media platforms that Saudi Arabians use the most—was utilized to reach the participants in the current study.

3.2 Research Participants and Design

This cross-sectional survey, held in Saudi health facilities, focused on healthcare professionals, including Physicians, dentists, pharmacists, nurses, emergency healthcare workers, laboratory technicians, and administrative personnel. However, it did not include medical or medical college interns or students.

3.3 Sampling Method and Sample Size

According to the most recent statistics, Saudi Arabia employs 400,000 healthcare professionals [12]. After applying the criteria for inclusion and exclusion, 384 healthcare professionals were recruited for the current study, with a 95% confidence level and a 5% margin of error. We employed a multistage sampling strategy. Healthcare organizations (Ministry of Health, university, military, university, and private hospitals) comprised the first stage, a stratified cluster. The study used non-probability sampling (snow bowling sampling) to choose about 100 healthcare professionals from each stratum through a self-administered online questionnaire.

3.4 Data Gathering Techniques, Tools Employed, and Measurements Variables

Variables

The dependent variables were the mean score of healthcare professionals' perceptions of their institutions' safety culture and sharps injury prevention policies. In contrast, the independent factors included the employees' associated departments, age, nationality, gender, occupation, years of experience, and hospital (private or public). The Culture of Safety [9] is defined as: A "culture of safety" refers to the management and employees' shared commitment to ensuring workplace safety [9]. Every facet of the workplace influences a safety culture. Several factors, such as management's dedication to safety, healthcare professionals' participation in safety decisions, how workplace safety hazards are handled, feedback on safety enhancements, and encouragement of personal accountability, influence how employees view the existence of a safety culture.

3.5 Survey: (refer to the appendix)

Three parts constituted the self-administered electronic survey used in this investigation (see Appendix A). A survey of the Disease Control and Prevention (CDC) sharps injury avoidance workbook [9] was used to gauge the opinions of the healthcare personnel. However, a team of experts in occupational medicine, infection control, preventive medicine, and health quality reviewed the questionnaire to verify its content and readability validity. Additionally, a pilot sample was used to assess the reliability, and the internal consistency determined by the Cronbach's alpha coefficient was 0.76, showing high reliability. However, the proposed scoring system was used to estimate the degree of perception; the maximum total score was 50. Each participant's rating score was determined and classified as poor if the total score was lower than 16, good if the overall score was between 16 and 33, and excellent when the overall score was greater than 33.

3.6 A Plan for handling data and Analysis

Data input and analysis were conducted using the SPSS statistical software package (version 20.0; IBM Corp., Armonk, NY, USA). Phases of data input and coding were carried out to improve the quality of the data. For qualitative variables, data were summarized as frequencies and percentages; for quantitative factors, means and standard deviations were used. The median test was employed to identify the statistically significant differences between participant responses and other factors.

3.7 Ethical approval

Data gathering started after receiving approval from King Abdullah International Medical Research Center's ethical and scientific council at King Abdul-Aziz Medical City. The data were kept private throughout the study and the participants' privacy was protected. The patients confirmed their consent to take part in the current investigation.

4. Results

4.1 Demographic characteristics

Table 1 demonstrates that 397 healthcare professionals from the study population answered our online survey, with around 25% of the participants coming from the predetermined Saudi health sectors. Of them, over half were under thirty years old. Almost sixty percent (60.5%) of the participants were female, and more than two-thirds (71%) were Saudi. On average, over fifty percent (57%) had been at their current position for more than 5 years. Figure 1 provides a summary of the participants' work history. Thirty percent of the participants were nurses, and fifty percent were physicians. Regarding the departments, 20% of those participating were from the nursing department.

Table 1: Demographic characteristics of participants (n=397)

Demographic characteristics	Frequency (n)	Percent (%)
Age category		
20 - 30 years	213	53.7
31 - 40 years	167	42.1
41 - 50 years	17	4.3
Gender		
Male	157	39.5
Female	240	60.5
Nationality		
Saudi	285	71.8
Non- Saudi	112	28.2
Health Sectors		
Governmental Hospitals (Ministry Of Health)	110	28
Governmental Hospitals (Military)	105	26
University Hospitals	101	25
Private Hospital	81	20
Length of Experience		
Less than five years	170	42.8
From five to ten years	114	28.7
More than ten years	113	28.5

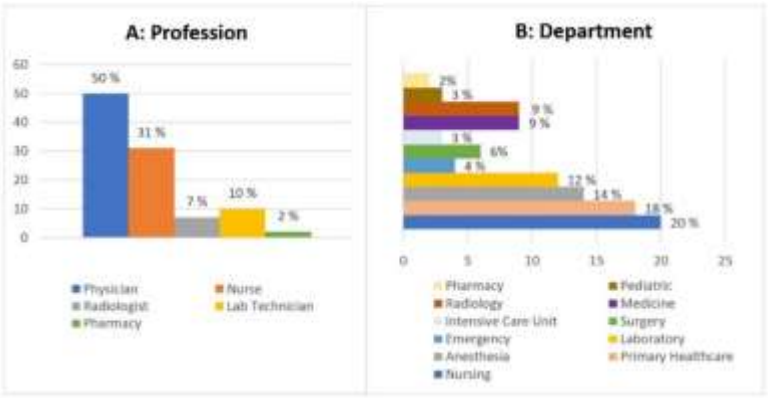

Figure 1: The participants' occupational history, jobs (A), area, or departments (B). (n=397).

4.2 Past History of Blood or Other Body Fluid Exposure

Nearly two-thirds of individuals were not exposed to blood or other bodily fluids, as illustrated in Figure 2. A third of them, however, indicated having at least one work contact with blood or other bodily fluids (26% had a sharp injury, and 33% had a mucocutaneous exposure). 77% of participants reported that their health institutions had a process or policy for reporting exposure to blood and body fluids, as shown in Figure 3. However, 12% of individuals only reported their exposure occurrences, indicating that over 50% of participants in the current research who had a history of exposure did not disclose their incidents. Two-thirds of participants exposed to blood or other bodily fluids reported having good or excellent experiences regarding post-exposure care, according to Figure 4, which compares participant experiences toward the post-exposure management offered by their health institutions.

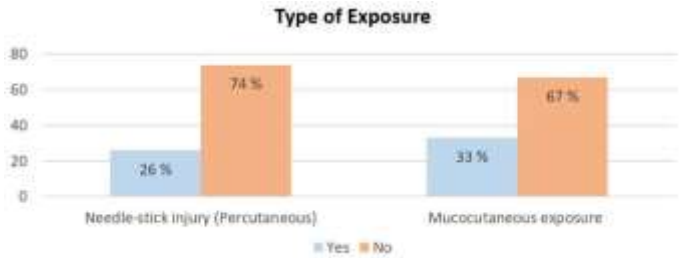

Figure 2: The participants' exposure history to blood or other body fluids (n=397).

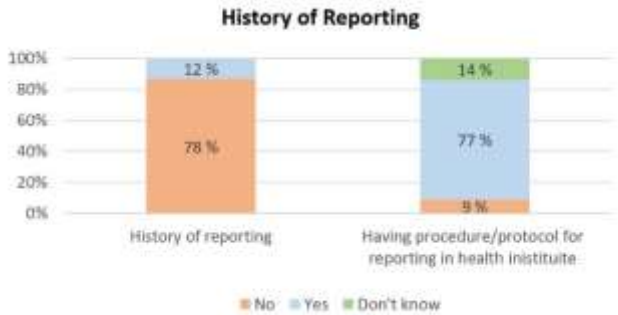

Figure 3: The participants' reporting history of blood or other body fluids (n=397).

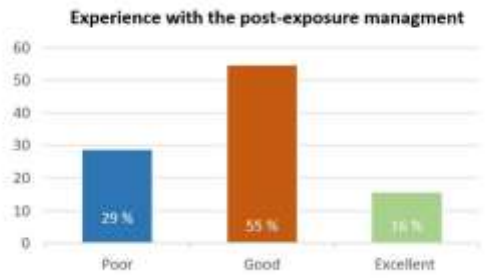

Figure 4: The participants' experience with post-exposure management (n=132).

4.3 Perceptions of a Safety Culture

About 3% of the participants were classified as having a poor view of the safety culture after answering the question intended to reflect the safety culture in healthcare facilities. Nonetheless, the median score for the total score was 31, with a confidence interval (CI) of (29.71 - 30.59), and the majority of individuals (97%) had good and exceptional perceptions (Table 2). Regarding the first two questions concerning their health institutes' adherence to safety and if they thought safety was an active agenda item for staff meetings, nearly half of the participants were unsure, as shown in Table 3. However, almost one-third of the participants stated that their company did not promote or support the reporting of mistakes and dangerous situations, nor did it incorporate personal responsibility for safety as a component of their workers' yearly performance reviews. Other queries, however, received highly favorable answers. Regarding the link between the participants' demographic and occupational factors and their overall perception score, Table 4 shows that there is no statistically significant correlation between their perceptions and their demographic features. Nonetheless, there were patterns of lower perception ratings among private hospital participants, and the differences were statistically significant ($p < 0.001$), which is an interesting observation.

Table 2: Participants' perceptions score of the culture of safety (n=397)

Score of perceptions		
Total Score		
95 % CI*	29.71 – 30.59	
Range	14- 38 points	
Median	31 points	
Mode	31	
Mean ± SD**	30 ± 4.4 points	
Score Category	**Frequency**	**Percent (%)**
Poor	12	3
Good	318	80
Excellent	67	17

**CI: Confidence Interval,*
*** SD: Standard Deviation*

Table 3: Culture of safety perceptions among all participants (n=397)

Item	No (%)			Score (max=5)	
	Agree/ Strongly agree	Uncertain	Disagree/ Strongly disagree	Mean ± SD	Median
1. Commitment to safety	142 (35 %)	205 (52 %)	50 (13 %)	2.8 ± 0.4	3
2. Feedback on safety	151 (38 %)	180 (45 %)	66 (17 %)	2.9 ± 0.7	3
3. Promotion of hazard reporting	175 (44 %)	91 (23 %)	131(33 %)	3 ± 0.4	3
4. Personal accountability	227 (57 %)	27 (7 %)	143 (36 %)	3.1 ± 1.12	4
5. Hazard correction	297 (75 %)	57 (14 %)	43 (11 %)	3.8 ± 1.1	4
6. Availability of sharps containers	249 (63 %)	87 (22 %)	61 (15 %)	3.5 ± 1.05	4
7. Employee/management collaboration on safety	267 (67 %)	85 (21 %)	45 (12 %)	3.7 ± 0.98	4
8. Safety training	276 (69 %)	103 (26 %)	18 (5 %)	3.7 ± 0.79	4
9. Provision of safer technology	251 (63 %)	107 (27 %)	39 (10 %)	3.6 ± 0.9	4
10. Non-punitive reporting environment	350 (88 %)	23 (5.8 %)	24 (6 %)	4 ± 0.8	4

Table 4: Relation between participants' total perception score and their characteristics. (n=397)

	Perception score (max=50)		
Demographic and Occupational characteristics	**Median**	**Median test Statistic**	**p-value**
Age category			
20 - 30 years	31		
31 - 40 years	30		
41 - 50 years	31	5.1	0.07
Gender			
Male	30		
Female	31	2.5	0.13
Nationality			
Saudi	31		
Non- Saudi	31	3.05	0.61
Health Sectors			
Governmental Hospitals (Ministry Of Health)	31		
Governmental Hospitals (Military)	33		
University Hospitals	26		
Private Hospital	33	7.3	0.009*
Profession			
Physician	31		
Nurse	31		

Radiologist	30			
Lab worker	30			
Pharmacist		31	4.2	0.06
Length of Experience				
Less than five years	30			
From five to ten years	31			
More than ten years		31	2.7	0.249

(*) Statistically significant at p<0.05

3. Discussion

According to Saudi Arabian statistics data, Saudi residents constitute over half of the nation's healthcare workforce, with women accounting for most nursing personnel [12]. The current study aimed to find out how Saudi Arabian healthcare professionals perceived their institutions' safety culture and efforts to avoid sharps injuries. Sixty percent of the personnel were female, and most participants (71%) were Saudi. Furthermore, because the administrative structure and the health institution's safety culture are deeply interconnected, four healthcare organizations were chosen to gauge how their employees felt about the safety culture and the prevention of sharps injuries. Blood exposure at work is a very common concern for healthcare professionals. The incidence rates of blood exposure vary throughout different research worldwide based on factors such as countries, bed count in hospitals, health personnel job categories, and data gathering periods. Nearly one-third of the participants in this research had been exposed to blood at some point in their careers. This rate is lower than that of one earlier research in Egypt [17], comparable to studies carried out in Iran [15] and Lebanon [16], and higher than those documented in Saudi medical literature [13,14].

In contrast to other studies that employed registries or other data sources, the present study's confidential data collection allowed for the admission of exposure occurrences that were never recorded, which may account for the higher prevalence rate of blood exposure. It is difficult, and leadership assistance is needed to report blood exposure incidents to the hospital's relevant authorities. According to a prior study, less than half of the exposed people only documented their blood exposure occurrences, which appears to align with the current findings [13,18]. Furthermore, this underreporting phenomenon could explain the lower exposure rates found in earlier research that used reporting papers as their data source. Post-exposure care should be implemented following unintentional occupational contact with blood and body fluids to detect and avoid positive seroconversion as soon as feasible. Nearly two-thirds of participants in the current research who had been exposed to blood or other bodily fluids reported being satisfied with the occupational clinic's follow-up treatment and post-exposure therapy. Nonetheless, the earlier study [7] emphasized the discontent with waiting times and the necessity of quick turnaround times for test results from source patients, which might lessen the fear and anxiety experienced by most healthcare professionals. A key component of the effectiveness of the occupational prevention of injuries program is establishing a safety culture to safeguard patients, staff, and other individuals in the healthcare setting. According to the current survey, Saudi healthcare facilities generally had a positive opinion of a safety culture. Interestingly, half of the participants were unsure if their healthcare organization prioritized worker safety despite health institutions working to create a safety culture for their employees.

Furthermore, a third of them had a negative opinion of their employers' initiatives to promote and incentivize detecting and reporting errors and hazardous situations. The misinterpretation of the leadership responsibilities [19] of the safety culture in their healthcare institutions may cause this disparity. The current study's findings indicate no significant correlation between the participants' characteristics and how they perceived the safety culture at their respective healthcare facilities.

This demonstrates equal perception ratings across various ages, genders, job categories, and experience durations, supporting the survey's generalizability. Although it is difficult to explain this statistically significant result, this study revealed lower perception scores among healthcare workers in private hospitals, which may be associated with the fact [20] that the private medical sector has an entirely distinct structure that is neither controlled nor regulated directly by the government legislation regarding safety culture. The cross-sectional nature of the current study is one of its limitations; as a result, the results are mostly observations used to formulate the hypothesis. Furthermore, we were unable to employ the probability sampling approach due to the restricted accessibility to the Saudi health institutions, which therefore affected the degree of generalizability of the research.

6. Conclusion

According to this study, healthcare professionals at Saudi institutions had positive perceptions of a safety culture and the avoidance of sharps injuries. Although there has been considerable success in reducing the risks of bloodborne pathogen exposure at work, further research has to be performed. Employee perceptions of the safety culture should be evaluated as baseline data for prospective enhancement to communicate and demonstrate leadership support for and dedication to improving safety.

Financial Relationships and Conflicts of Interest

Every author has disclosed that they have no financial or conflicting interests with any groups that could be interested in the work they have contributed, either now or in the last three years.

Authorship

All of the authors have read and approved the manuscript, all of them have confirmed that the standards for authorship have been fulfilled, and all of them agree the work is honest.

References

1) CDC. Updated U.S. public health service guidelines for the management of occupational exposures to HBV, HCV, and HIV and recommendations for post exposure prophylaxis. Recommendations and reports. 2001, 50:1-42.
2) World Health Organization (WHO), Sharps injuries: global burden of disease from sharps injuries to healthcare workers. (2003). Accessed: May 16 2022: https://apps.who.int/iris/rest/bitstreams/51099/retrieve..
3) National institute for occupational safety and health (NIOSH).Preventing needle stick injuries in health care settings. (2000). Accessed: May 16 2022 : http://www.cdc.gov/niosh/docs/2000-108/pdfs/2000-108.pdf..
4) O'Connor MB: Needlestick injury advice in the UK and Ireland. Journal of Hospital Infection. 2009, 1:185-6. 10.1016/j.jhin.2008.11.004
5) Memish ZA, Almuneef M, Dillon J: Epidemiology of needle-stick and sharps injuries in a tertiary care center in Saudi Arabia. American journal of infection control. 2002, 1:234-41. 10.1067/mic.2002.118841
6) Jagger J, Hunt EH, Pearson RD: Sharp object injuries in the hospital: causes and strategies for prevention. American journal of infection control. 19901, 18:227-31. 10.1016/0196-6553(90)90163-M
7) Gershon RR, Flanagan PA, Karkashian C, et al.: Health care workers' experience with postexposure management of bloodborne pathogen exposures: a pilot study. American journal of infection control. 20001, 28:421-8. 10.1067/mic.2000.109907
8) Behzadmehr R, Balouchi A, Hesaraki M, et al.: Prevalence and causes of unreported needle stick injuries among health care workers: a systematic review and meta-analysis. Reviews on environmental health. 2021, 10.1515/reveh-2021-0148

9) Centers for Disease Control and Prevention (CDC). Workbook for Designing, Implementing, and Evaluating a Sharps Injury Prevention Program.. (2008). Accessed: 15 May 2022: http://www.cdc.gov/sharpssafety/pdf/sharpsworkbook_2008.pdf.
10) Samargandy SA, Bukhari LM, Samargandy SA, et al.: Epidemiology and clinical consequences of occupational exposure to blood and other body fluids in a university hospital in. Saudi Arabia. Saudi medical journal. 2016, 37:783. 10.15537/smj.2016.7.14261
11) El-Hazmi MM, Al-Majid FM: Needle stick and sharps injuries among health care workers: a 5-year surveillance in a teaching center in Saudi Arabia. Biomedical Research. 2008, 19:133-40.
12) Saudi Ministry of Health, Key Health Indicators. (2017). Accessed: July 2022: https://www.moh.gov.sa/en/Ministry/Statistics/Indicator/Pages/Indicator-1437.aspx.
13) Alsabaani A, Alqahtani NS, Alqahtani SS, et al.: Incidence, Knowledge, Attitude and Practice Toward Needle Stick Injury Among Health Care Workers in Abha City, Saudi Arabia. Frontiers in Public Health. 2022, 10:771190. 10.3389/fpubh.2022.771190
14) Mahfouz AA, Abdel Moneim I, Khan MY, Daffalla AA, Diab MM, Shaban H, Al Amri HS: Injection safety at primary health care level in south-western Saudi Arabia. EMHJ-Eastern. Mediterranean Health Journal. 2:443-450.
15) Yarahmadi R, Dizaji RA, Hossieni AF, Farshad AA, Bakand S: The Prevalence of Needle sticks injuries among health care workers at a hospital in Tehran. Iranian Journal of Health, Safety and Environment. 2014, 23:23-9.
16) Sabbah I, Sabbah H, Sabbah S, Akoum H, Droubi N: Occupational exposures to blood and body fluids (BBF): assessment of knowledge, attitude and practice among health care workers in general hospitals in Lebanon. Health. 2013, 5:70-78. 10.4236/health.2013.51010
17) HanafiMI,Mohamed AM, KassemMS, ShawkiM.Needlestick injuries among health care workers of University of Alexandria Hospitals. East Mediterr Health J. 2011, 17:26-35. 10.26719/2011.17.1.26
18) Elmiyeh B, Whitaker IS, James MJ, Chahal CA, Galea A, Alshafi K: Needle-stick injuries in the National Health Service: a culture of silence. Journal of the Royal Society of Medicine. 2004, 97:326-7. 10.1177/014107680409700705
19) Alonazi NA, Alonazi AA, Saeed E, Mohamed S: The perception of safety culture among nurses in a tertiary hospital in Central Saudi Arabia. Sudanese journal of paediatrics. 2016, 16:51.
20) The private health sector: an operational definition. (2020). Accessed: July 2022: https://www.who.int/docs/default-source/health-system-governance/private-health-sector-an-operational-definition.pdf.