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Original Article

The Return on Investment value of integrating the WHO Patient Safety Curriculum in Nursing Diploma: Forecasting case study

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المخلص

أهداف البحث: تهدف الدراسة إلى التنبؤ بالأثر المالي باستخدام "عائد الاستثمار" عند دمج منهج منظمة الصحة العالمية لسلامة المرضى على أحد برامج الدبلوم والذي يمتد لمدة سنتين استناداً على التقارير المقدمة من عدد المرضى المصابين بتقرحات الفراش أثناء إقامتهم في المستشفى.

طرق البحث: في هذه الدراسة المقطعية، قمنا بمقارنة الأثر المالي لدمج منهج منظمة الصحة العالمية لسلامة المرضى في أحد برامج الدبلوم في التمريض بإحدى مستشفيات السعودية، وأظهرت نتائج مشاركة 51 طالب في السنتين المتواليتين للدبلوم 2019 و 2021 معلوماتهم الديموغرافية وتصورهم عن سلامة المرضى ومقارنة المجموعتين، حيث استندت جميع التحليلات على البيانات التاريخية وتعليقات الطلاب.

النتائج: كان تقدير الإيرادات الإجمالية لرسم الطلاب غير المنتسبين خلال برنامج واحد أعلى من إجمالي الفوائد المقدرة من التنبؤ. من خلال البرنامج، كان إجمالي تقدير التكلفة المالية أعلى من تكلفة دراسة الدبلوم والتي يتم دفعها مرة واحدة. بلغ قيمة العائد على الاستثمار (-7.73%). كانت نسبة تقرحات الفراش أقل من معيار وزارة الصحة. كان أعلى متوسط للموقف الشخصي من سلامة المرضى، وأقلها كان للمعرفة بالخطأ وسلامة المريض (4.05 ± 0.66 و 3.33 ± 0.77) على التوالي.

الاستنتاجات: تشير الدراسة إلى أن عوائد الاستثمار ذات قيمة سلبية، وبالرغم من ذلك فإن الفوائد المتعددة والمتوقعة على التعليم والتدريب في قطاع الصحة كبير.

الكلمات المفتاحية: التمريض؛ سلامة المرضى؛ التعليم؛ عائد الاستثمار؛ تقرحات الفراش

Abstract

Objectives: To forecast the monetary impact by using Return on Investment (ROI) when integrating the World Health Organization (WHO) patient safety curriculum within the two years of an active diploma duration for 2019 and 2021 classes based on reported Hospital-Acquired Pressure Ulcers (HAPU) events.

Methods: During this cross-sectional study, we compared the financial impact of integrating the WHO Patient Safety Curriculum in one 2-year diploma program in Saudi Hospital for class 2019 and 2021. All 51 qualified students were identified and included in this study. Demographic and patient safety perceptions for all students in both categories were analyzed and supported by historical data and students' feedback.

Results: The whole revenue estimation for unaffiliated students' fees during one program was found higher than the total estimated benefits from forecasting. The total monetary cost estimation was higher than the integrated Diploma's cost during the program that was paid once. The ROI is (-7.73%). The HAPU percentage was lower than the MOH benchmark. The highest mean was for the personal attitude to patient safety, and the lowest was for knowledge of error and patient safety (4.05 ± 0.66 and 3.33 ± 0.74 , respectively).

Conclusions: The study indicated a negative value from business perspectives; however, the projected multiple intangible benefits on education and training of the health sector are significant.

Keywords: Education; Nursing; Patient safety; Pressure ulcers; Return on Investment

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Introduction

Patient safety concepts and practices are mandatory in healthcare systems. To start early, undergraduate medical and nursing students must acknowledge that safety and quality of care are essential for their careers.¹ In 2011, the World Health Organization (WHO) established a patient safety curriculum as a learning resource.² This curriculum contains comprehensive information involving essential patient safety principles and concepts.² In 2016, the Saudi 2030 Vision and the National Transformation Program (NTP) were launched to enhance life quality, among other objectives.³ Patient safety guidelines improved medication safety and decreased medical costs and burdens by assessing quality medical services and developing interactive training.³

Return on Investment (ROI) parameter was selected to evaluate the financial value of integrating the WHO Patient Safety Curriculum in a Saudi Hospital institution's current diploma programs.⁴ ROI, a set of measures, explains a venture's economic performance and records a profit or loss cost relating to an investment decision.⁴ The implemented Adult Critical Care for Nursing Diploma at the Hospital was selected for this financial forecasting integration approach for two reasons. First, nurses are the most crucial healthcare providers that are associated with patients during their clinical works.^{5,6} There are areas of improvement in standard precautions among prospective nurses to reduce the infection contact in clinical settings, thus requiring extra knowledge and skills to deliver quality care services.^{5,6} Second, The Saudi Commission for Health Specialties (SCFHS) copyrights the national diploma curriculum content and focuses on patient care with limited emphasis on patient safety.⁷

Comparison of benefits that enhance health outcomes and mitigate patient safety risk showed that these benefits are equal compared to the risk of patient safety.⁸ Hospitalization's adverse events or medication errors and adverse reactions are considered risks for the patients.^{2,8} HAPU is among the most frequent events confronted by the healthcare system, which has a high cost on the patient's health due to morbidity and mortality.^{9,10} One study conducted in KSA documented that the aggregated prevalence of HAPUs was 39.3% of ICU adults, which was higher than some international studies that indicated <12% prevalence. The high range of the HAPU will increase the length of stay and, accordingly, the cost.⁹ Therefore, the participants were selected based on procedures' high volume and substantial risk to be ROI calculated as a reduced cost when patients' safety curriculum would be integrated based on harm reduction and care improvement.² This study aims to identify ROI value by integrating the WHO Patient Safety Curriculum in Nursing Diploma within the two-year diploma duration for 2019 and 2021 classes. The ROI values were based on

reported pressure ulcer events, in addition to identifying diploma students' perceptions of patient safety using the WHO patient safety assessment questionnaire.¹⁰

Materials and Methods

Study design and setting

This study is a cross-sectional forecasting case study that was divided into two parts. The financial part included collecting historical data for calculating the ROI from the Hospital's concerned departments and performing a literature review for validation and alignment with the study's objectives. ROI was calculated as a percentage. One of the methodologies in forecasting the ROI value is to evaluate any project's likely financial and operational performance payoff before the project is implemented and allocations are made.⁴ The available data was sufficient to forecast the ROI of integrating an external curriculum within an established national curriculum in KSA. Available Hospital financial data was utilized or combined with an average of two references from literature not exceeding the internal ceiling of hospital data. We focused only on one reported HAPU event through the hospital Occurrence Variance Reporting system (OVR) during 2019, intending to ensure that the integration would improve patient safety.

Study period

We collected data on two years' duration of the Nursing Diploma for all students in the two following classes of 2019 and 2021. We extracted and collected the data in March 2021.

Sample size and study participants

The available direct logistical and financial data within the Hospital for two years of the Diploma was utilized in forecasting the ROI value of the WHO Patient Safety Curriculum integration into the current Nursing Diploma; data were collected based on Jack's Methodology.⁴ The Adult Critical Care for Nursing Diploma was selected as a study venue based on the high volume and high-risk procedures during 2019. The financial data were collected from experts' opinions and stakeholders in each field at the Hospital, including the Departments of Quality, Nursing, Education, Human Recourses, and Finance, concerning sample size calculation based on a literature review conducted.

Based on students' perceptions of patient safety, Diploma students of both groups were recruited: students 2019 (n = 33) and 2021 (n = 18).

Data collection

Forecasting ROI value: For the Intensive Care Unit (ICU) staffing plan, nurse/patient ratios were calculated as 1:2.^{9,11} The physician/patient ratio was 1:8.^{11,12} The suggested ratio is 1:3/4 of allied health professionals required if ICU patients experience immobile, nutrition support, medication guide, and given support to breath depending on each health case.¹² The strength of required operational

and administrative staff depends on 24 h.¹² All staffing plans were duplicated to cover day and night timing.¹²

All estimated monetary benefits of two years of program and forecasting cost reduction of ICU length of stay (LOS) for one patient during 10 days were determined in the ROI formula based on the average LOS of two national studies.^{9,13} The cost of an ICU bed for a patient was calculated as an average per day based on a Saudi study in 2019¹³ (which is SAR 18,000, and internal hospital data, which is SAR 25,000). ROI value was calculated based on the estimated cost of the diploma program's direct monetary and the integrated Diploma, including the submission fees for the new integrated program approval from the Saudi Commission for Health Specialties (SCFHS). Moreover, benefits and costs numerical values were collected only for direct monetary aspects; the program's indirect cost estimation was excluded in the current study.⁴ However, ideally, for determining the ROI of any project, benefits and costs must include monetary and non-monetary aspects to evaluate the project's efficiency and effectiveness.¹⁴

For patients' perception: All enrolled students of classes, 2019 and 2021, were recruited regardless of their gender, age, or employment status before pursuing the Diploma. Non-Saudi students and those with a degree less than a bachelor's degree were excluded.

Analysis

Return on Investment analysis

ROI formula (Figure 1) was calculated based on data obtained from the literature review, available official data, and public prices of health services of the Hospital. The potential consequences of the proposal from the clinical, economic, and social perspectives were evaluated. These returns could be positive or negative.

$$ROI = \frac{\text{Total impact} = \text{Benefit} - \text{Cost}}{\text{Investment} = \text{Cost} * 100}$$

The adjustment factors: The deadweight is the percentage of return obtained without the proposal. The attribution is the percentage of the return caused by activities independent of the proposal. Also, the displacement is the percentage of the return that would have displaced another return, and the drop-off denotes the rate of return deterioration over time. All these data were subtracted from the return.

Statistical analysis

Patients' perceptions were analyzed using the SPSS Statistical Software (version 25; IBM). Counts and percentages

were used for categorical variables, while continuous and ordinal variables were expressed as mean value \pm standard deviation. Descriptive statistics were employed to document the basic features of the data within the study, and descriptive summaries were provided regarding the samples used and the variables of interest. Pearson chi-square test was employed to evaluate the differences in the proportion of categorical variables. The significance level for all tests was set to $\alpha = 0.05$.

Results

Table 1 shows the estimated benefits of the integration for the Nursing Diploma program of 2019 for two years. The total revenue estimation for unaffiliated students' fees during one program was higher than the estimated benefits from forecasting. The study suggested that the integration would enhance patient safety awareness, reducing the cost of reported HAPU for one patient during 10 days average of stay in ICU bed with proposed staffing plan during 24 h.^{9,11–13}

Table 2 shows the estimated direct cost of integrating for two years of the Nursing Diploma program in 2019. The suggested staffing plan is based on official data of human resources and health services of the Hospital. All salaries paid were calculated during the two years of the program, including official holidays. The total monetary cost estimation was higher than the integrated Diploma's cost during the program, paid once. Table 3 presents the ROI forecasting and calculation. Tables 1 and 2 show that the monetary benefits were combined with the cost to forecast the ROI by developing and calculating the benefit-cost ratio (BCR). The ROI formula given in Figure 1 was used to forecast this integration (-7.73%). Therefore, a negative rate was the forecasting value of the ROI of integrating the patient safety curriculum during two years of an active diploma for 2019 and 2021 classes. Financially, the negative tangible value is expected when the cost is higher than the estimated monetary benefits.

A brief data of the reported HAPU during 2019 at the Hospital is presented in Table 4. The HAPU percentage was lower than the Ministry of Health (MOH) benchmark.

During the study period, 51 qualified students were identified and recruited. Table 5 shows the demographic characteristics of the participants. According to the data, 34 females (66.7%), 22 (43.1%) aged 26–30 years, 38 have full-time employment (74.5%), 45 (88.2%) have Bachelor's degrees, and the majority sponsorship (35) is from the Hospital (68.6%). 64.7% ($n = 33$) of students were present in 2019 while in 2021, there were 18 (35.3%) students. Before joining the Diploma, no differences in age, gender, employment status, education, and sponsorship were noted.

Results from groups' comparisons of variables are presented in Table 6. The highest mean for the personal attitude to patient safety and the lowest was for knowledge of error, and patient safety was (4.05 ± 0.66 and 3.33 ± 0.74), respectively. There was an association of knowledge of error and patient safety ($P = 0.022$), agreement towards the safety of the healthcare system ($P = 0.019$), and personal influence over safety ($P = 0.012$). No significant differences were observed between personal attitudes to

$$ROI = \frac{\text{Total impact (A)}}{\text{Investment (B)}}$$

(A) Total Impact = Benefit - Cost
(B) Investment = Cost * 100

Figure 1: ROI formula.

Table 1: Estimated benefits of the WHO Patient Safety Diploma Integration.

Estimated benefits	Item/Unit	Quantity	Average cost (SAR)	Estimated operational days	Total estimated benefits (SAR)
Diploma Revenue Estimation	Unaffiliated student Diploma fees	9	90,000 (Once)	NA	810,000
Reduced cost of reported Pressure Ulcer of one patient	Clinical Nurse (day and night)	2	10,000 (Monthly)	10 days	6666
	Physician (day and night)	2	35,600 (Monthly)	10 days	23,733
	Administrative Staff	2	13,900 (Monthly)	10 days	9266
	Quality Administrative Nurse	2	10,000 (Monthly)	10 days	6666
	Allied Health Professionals	2	12,500 (Monthly)	10 days	8333
	ICU Hospital Bed	1	18,333 (Monthly)	10 days	183,333

Table 2: Estimated direct cost of the WHO Patient Safety Diploma Integration.

Estimated cost	Item/Unit	Quantity	Average cost (SAR)	Estimated operational months	Total estimated cost (SAR)
Direct Cost Estimation of Monetary Benefits	Student diploma fees	24	8000	NA	192,000
	Salary of nurse trainer	2	10,000	24	480,000
	Salary of clinical nurse	1	10,000	24	240,000
	Salary of Nursing Program Director	1	10,000	24	240,000
	Cost of Integrated Diploma	SCFHS approval program cost	1	10,000	NA

Table 3: Forecasted ROI of the WHO Patient Safety Diploma integration.

Benefits = (SAR)	+	810,000 262,167	Diploma Revenue Estimation Reduced cost of reported Pressure Ulcer of 1 patient
		1,072,167	
Cost = (SAR)	+	1,152,000 10,000	Direct Cost Estimation of Monetary Benefits Cost of Integrated Diploma
		1,162,000	
BCR = (Benefits/Cost)		$\frac{1,072,167}{1,162,000} = 92\%$	
ROI = (B - C/C*100)		$\frac{1,072,167 - 1,162,000}{1,162,000} \times 100 = -7.73\%$	

Table 4: Reported Hospital-Acquired Pressure Ulcers (HAPU) in 2019.

Hospital Total Occurrence n	Variance Reporting (OVR)	Hospital data of reported HAPU n (%)	Ministry of Health Benchmark of HAPU %
2504		24 (0.958)	1.3

Table 5: Demographics of the Adult Critical Care for Nursing Diploma Students.

Variables	Nursing Diploma			P value
	Total n = 51 (100%)	Students 2019 n = 33 (64.7%)	Students 2021 n = 18 (35.3%)	
Age (in years)				
20–25	18 (35.3)	15 (45.5)	3 (16.7)	0.090
26–30	22 (43.1)	13 (39.4)	9 (50)	
>31	11 (21.6)	5 (15.2)	6 (33.3)	
Gender				
Female	34 (66.7)	23 (69.7)	11 (61.1)	0.534
Male	17 (33.3)	10 (30.3)	7 (38.9)	
Employment status before joining the Diploma				
Employed full-time	38 (74.5)	25 (75.8)	13 (72.2)	0.782
Student	13 (25.5)	8 (24.2)	5 (27.8)	
Highest level of education before joining the Diploma				
Bachelor's Degree	45 (88.2)	30 (90.9)	15 (83.3)	0.422
Post Graduate	6 (11.8)	3 (9.1)	3 (16.7)	
Sponsorship				
Affiliated student	35 (68.6)	24 (72.7)	11 (61.1)	0.393
Unaffiliated student	16 (31.4)	9 (27.3)	7 (38.9)	

Table 6: Patient Safety Perception of the Adult Critical Care for Nursing Diploma Students.

Variables	Nursing diploma students (n = 51)	
	Mean ± SD	p-value
Knowledge of error and patient safety	3.33 ± 0.74	0.022*
Agreement towards the safety of healthcare system	3.51 ± 0.42	0.019*
Personal influence over safety	3.50 ± 0.50	0.012*
Personal attitudes to patient safety	4.05 ± 0.66	0.726
Expectation about patient care	3.52 ± 0.42	0.278

Note: *significant at $p < 0.05$ level.

patient safety ($P = 0.726$) and patient care expectations ($P = 0.278$).

Discussion

The proposed integration of this case study's data showed that the prediction of the ROI value is a negative value from a financial perspective based on the reported HAPU. However, the WHO's patient safety curriculum's projected integration in the Adult Critical Care for Nursing Diploma assumed that enhancing the knowledge would decrease the reported HAPU events and cost in accumulated years as a long-term impact.⁴ Comparison of the students' perceptions of patient safety results of two groups showed closeness in all perceptions of each group. The highest area was the participants' knowledge of healthcare errors and patient safety, followed by the agreement towards the safety of the healthcare system and personal influence over safety.

The integration's projected benefit-cost ratio is 92%. This explains how this integrated education approach focuses on developing new skills for the next job with a medium time frame and moderate payback.¹⁴ In the education and healthcare sectors, intangible qualitative aspects are more significant than quantifying aspects.^{14,15} The negative ROI resulted in more intangible benefits, including academic enrichment of the diploma curriculum, increased student

experience and satisfaction, greater patient safety compliance, and Saudi Vision alignment.

International Patient Safety Goals (IPSG)⁸ require reducing the harm rather than preventing the event. The benchmark reduction was based on the national level. The MOH benchmark in HAPU was 1.3% in 2019. The data reported in this study were 0.95% of the total reported Hospital's total OVR. Therefore, as a business impact, this integration predicts more reduction of the national benchmark for pressure Ulcer events by 5% from the previous result within two years of the diploma integration. A Saudi study showed that HAPU prevalence in adults is higher than reported globally. It suggested the nursing ratio and high workload⁹ be the reasons for such high rates.

Both groups had a different range of age, education level, and employment status. The diversity of this sample was suitable for studying the monetary impact of integrating the WHO patient safety curriculum in a Nursing Diploma to prepare them for their next job. During a tough economic time, education and training can be directed to be a cost-effective potential method.¹⁶ Adult education and career training can contribute to direct financial payback and lower social costs by improving life quality.¹⁶

This case study described the level of perception towards patient safety among nursing diploma students. The p-values of participants' knowledge of healthcare errors and patient

safety is the highest level of perception. Similar to another study,¹⁷ this result presented nursing students' willingness to identify, report, and deal with unsafe medical practices. Another significant level of perception was personal influence over safety. The previous study explained how the nursing workplaces could affect their questionnaire responses.¹⁷ Most of our study participants were employed. Therefore, unsafe clinical practice and the type of clinical setting they had experienced might have influenced their safety perception.¹⁷

The target deliverable is the quality of patient life that could appear in students' acquainted and acquired skills. Students' reported patient safety perception data should not be used as a baseline rather than continuous learning and enhancement of error reporting and managing patient hazards. A formal patient safety curriculum is needed to support healthcare vision and strategy. A specialized certificate from WHO Patient Safety for instructors and participants would add a significant value to the integrated Diploma when it is completed.

This case study has multiple strength points as expected intangible results identified during stakeholder interviews and patient safety questionnaire analysis. The Hospital Administration's initial approval of this integration aligns with Hospital and MOH strategic objectives. The Adult Critical Care for Nursing Diploma was selected for this study because it targeted adult critical care nursing students who emphasized patient safety education and had high patient contact.

The study has some limitations. It relates to the selection of forecasting methods to evaluate the ROI of this integration. It had to be implemented and reported in order to capture the level of knowledge enhancement of patient safety awareness pre-post curriculum implementation. HAPU reduction data had to be written after two years of Diploma. Furthermore, the Nursing diploma curriculum is supervised by SCFHS.⁷ It cannot be modified without official approval, which is lengthy. The integration process requires several stakeholders' involvement over several curriculum reviews and the availability of trained instructors. Therefore, these challenges highlighted the need for a feasibility study to determine the ROI. In general, measuring the ROI in the education and training sectors remained limited because educators perceive that ROI is a business module concerned only with finances.

Conclusion

A negative ROI value of the WHO patient safety curriculum integration within the two-year diploma duration for class 2019 and 2021 based on reported HAPU events from business perspectives was forecasted. However, the multiple projected intangible benefits on education and training of the health sector are significant. It is anticipated that patient safety knowledge and practice would decrease the reported critical events and avoid placing patients at risk, thereby reducing the overall cost in cumulative operational years.

Recommendations

The ROI percentage must not be misused for not accommodating the integration rather than promoting more feasibility studies to accommodate WHO patients' safety to all active diplomas. Although patient safety awareness before the integration is very encouraging, it does not reveal the actual level of understanding in practiced skills defined by the WHO curriculum. More quantitative research is recommended to assess healthcare providers' patient safety knowledge, practice, and personal attitudes.

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Conflict of interest

The authors have no conflict of interest to declare.

Ethical approval

This study was approved by KAMCIRB, registered at the National Biomedical Ethics Committee, King Abdul-Aziz City for Science and Technology, KSA (approval number 21-755, February 2021).

Authors contributions

R.F. wrote and designed the study, conducted research, collected data, and reviewed the manuscript. D.M. analyzed and interpreted data. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

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