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The Global Trigger Tool shows that one out of seven patients suffers harm in Palestinian hospitals: challenges for launching a strategic safety plan

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Abstract

Objective. The aim of this study was to evaluate patient safety levels in Palestinian hospitals and to provide guidance for policymakers involved in safety improvement efforts.

Design. Retrospective review of hospitalized patient records using the Global Trigger Tool.

Setting. Two large hospitals in Palestine: a referral teaching hospital and a nonprofit, non-governmental hospital.

Participants. A total of 640 random records of discharged patients were reviewed by experienced nurses and physicians from the selected hospitals.

Intervention. Assessment of adverse events.

Main Outcome Measures. Prevalence of adverse events, their preventability and harm category. Descriptive statistics and Cohen kappa coefficients were calculated.

Results. One out of seven patients (91 [14.2%]) suffered harm. Fifty-four (59.3%) of these events were preventable; 64 (70.4%) resulted in temporary harm, requiring prolonged hospitalization. Good reliability was achieved among the independent reviewers in identifying adverse events. The Global Trigger Tool showed that adverse events in Palestinian hospitals likely occur at a rate of 20 times higher than previously reported. Although reviewers reported that detecting adverse events was feasible, we identified conditions suggesting that the tool may be challenging to use in daily practice.

Conclusion. One out of seven patients suffers harm in Palestinian hospitals. Compromised safety represents serious problems for patients, hospitals and governments and should be a high priority public health issue. We argue that direct interventions should be launched immediately to improve safety. Additional costs associated with combating adverse events should be taken into consideration, especially in regions with limited resources, as in Palestine.

Keywords: patient safety, adverse event, harm, Global Trigger Tool, retrospective review Palestine

Introduction

The fourteen years since the publication of the Institute of Medicine's 'To Err Is Human' [1] have seen important steps in advancing patient safety practices. However, millions of patients worldwide still suffer from disabling injuries or death caused by unsafe medical care [2]. Monitoring the incidence of adverse events (harm) is essential for tracking patient safety, because doing so increases awareness of the problem and elevates recognition of the responsibility for improving patient safety at every level of the system [3]. It also permits tracking of the effectiveness and efficiency of improvement initiatives. The Institute of Healthcare Improvement (IHI) defines an adverse event as 'an unintended physical injury resulting from or contributed to by medical care that requires additional monitoring, treatment or hospitalization, or that results in death' [4].

Several studies have reported the prevalence of patient injuries in different healthcare settings in developed countries [5–13]; a few were from developing countries or regions with transitional economies [13, 14]. Unfortunately, how many patients are harmed in these latter regions remains unclear. Selecting the most effective, efficient and cost-effective way to identify harmed patients is necessary to reduce unfavorable clinical outcomes and wasted resources. Once selected, plans can be rationally generated and implemented to improve patient safety.

As a developing country, Palestine has started to focus recently on moving toward providing quality services in hospitals. Since 2011, access to quality health services has been on the strategic agenda of the Palestinian Ministry of Health (MoH) [15]. To achieve this goal, MoH has extended their collaboration with East Jerusalem hospitals on quality improvement efforts and accreditation. Despite these initiatives, hospitals and health policymakers in Palestine still lack the evidence and baseline patient safety data that are necessary for generating views and plans on improving patient safety and maintaining positive interventions after implementation. Unfortunately, this scenario applies to many other developing countries also [13].

The present study represents a retrospective review of medical records in a sample of two large Palestinian hospitals. We had two principal aims: (1) to determine the frequency, harm categories and preventability of adverse events (AEs) in hospitalized patients and (2) to evaluate the feasibility of using the well-established method of retrospective medical records review in a health care system with limited resources and possibly with less comprehensive medical records.

Methods

Study design

The study used the IHI Global Trigger Tool (IHI-GTT) for identifying adverse events. The IHI-GTT measures rates of harm resulting from medical care and provides a reliable hospital-based measure for tracking rates of harm over time [6, 16]. The trigger tool methodology includes a retrospective review of randomly selected patient medical records using 'triggers' (or clues) to identify possible adverse events [4].

Study instrument

A group of physicians and researchers within the selected hospitals assessed and adapted the original IHI version for the present study. Specific triggers were added and modified (see Appendix). Moreover, we added an additional stage of review by a quality supervisor. Similar to the Swedish GTT, we addressed questions about the degree that AEs are preventable [8]. AEs logged in the voluntary reporting system were checked in both hospitals and compared with IHI-GTT results over the study period.

Hospital selection

Severe budget constraints necessitated that we limited our selection of hospitals. We selected two large hospitals, but owing to confidentiality agreements, we cannot list them in this paper. However, we present information on their main characteristics: the two hospitals (1) are widely known for their concern about and efforts on quality improvement, (2) are eager and willing to improve patient safety, (3) to serve large communities (4) and are comparable in size and type of departments. They are part of the Palestinian health system. One of them is a referral teaching hospital, and the other is a nonprofit, non-governmental hospital. Hospital size ranged from 200 to 250 beds in 2009. The researchers obtained ethical approval for the study from the participating hospital boards and the Palestinian health authorities.

Record selection and medical records review process

Medical records were randomly selected from patients discharged between May and through August 2009. All admissions from inpatients in internal medicine, surgical, orthopedic and obstetric services during this four-month study period were printed out, and every ninth record was selected for review. This produced 80 medical records from each department for review and 320 medical records from each hospital (a total of 640 for the study). We followed IHI-GTT instructions for selecting records and screening [4]. Medical records were obtained from patients who were formally admitted to the hospital, with at least 24 h length of stay, and aged 18 years or older. Furthermore, their records were administratively complete and included a complete discharge summary. Owing to formal administrative issues, our sample consisted of live discharged cases only. We were not allowed by hospital administrators to review medical records for deceased patients (harm category I, Box 1).

Box 1. Categories of harm severity based on the NCC MERP* Index
- Category E: temporary harm to patient who required intervention
- Category F: temporary harm to patient who required prolonged hospitalization
- Category G: permanent harm to patient
- Category H: harm to patient required intervention to sustain life
- Category I: harm to patient resulted in patient death (excluded from present study)

*National Coordinating Council for Medication Error Reporting and Prevention.

The data collection team consisted of three persons: two primary record reviewers (experienced nurses) and a physician. The review team was selected on the basis of relevant clinical experience and record screening, interest, availability to participate, adequate knowledge of English (medical records language) and fluency in the local language (Arabic). To familiarize them with the tool, we conducted several training sessions. In addition, the team was trained on a pretest of 20 unrelated medical records. Each primary reviewer (nurse) screened records manually and independently from the other

reviewer using the trigger tool. When primary reviewers identified a trigger, they examined the record to determine whether harm had occurred. To insure common data collection methods, the two reviewers met after completing their separate reviews to compare AE findings and to reach consensus. The physician did not review the records but authenticated the consensus findings of the two primary record reviewers (nurses) and adjudicated the final type, number and severity level of events (see Box 1). In addition, he evaluated the degree of preventability and provided answers to reviewers' questions that arose during the review process. To test the validity of the medical records screening, a quality supervisor independently reviewed all records identified as having adverse events using a blank screening form.

Inter-rater reliability

An inter-rater reliability analysis using the Cohen's kappa statistics test was performed to determine consistency between the two primary record reviewers and between the primary reviewers and the secondary reviewer. Agreement between reviewers was defined when the reviewers identified the presence of AEs during their independent review of the patient's chart. The following criteria were used to interpret the statistic: poor (<0.00), slight (0.00–0.20), fair (0.21–0.40), moderate (0.41–0.60), substantial (0.61–0.80) and almost perfect (0.81–1.00) [17].

Adverse events, harm and preventability

The IHI-GTT detects AEs that cause harm to hospitalized patients resulting from medical care, not due to the underlying disease or the intended consequences of treatment. Therefore, we excluded AEs that occurred before admission.

Each AE was categorized for harm to the patient according to the National Coordinating Council for Medication Error Reporting and Prevention (NCC-MERP) index. This tool has five categories, E to I. The most severe (highest) harm category seen in our study was category H. We excluded harm category I, because we did not have access to records of deceased patients owing to local cultural issues. When more than one AE was identified in the same file, only the one with the highest harm category (see Box 1) was described and counted. To measure the degree of AE preventability, we used a six-point judgment scale [7]. During data entry, the six-point preventability score was grouped into three categories: no preventability (1), low preventability (2 or 3) and high preventability (4, 5 or 6).

Statistical analysis

The patients' hospitalizations were analyzed in our study. In line with the aim of our research questions, we used descriptive statistics to summarize the patient sample characteristics, AE rate, AE type, harm categories, preventability level and their relationship to the patients' gender and age. Cohen's kappa statistics test was used to examine inter-rater reliability. Data entry, cleaning and analysis were done using IBM SPSS version 20.0 (SPSS Inc., Chicago, IL, USA).

Results

The patient sample had a mean age of 44.2 years (SD: 19.6; range: 18–95) and a mean length of stay of 4.8 days (SD: 5.6; range: 1–70). Three hundred and eighty patients (59.4%) were female. Of the 640 randomly chosen records of hospitalized patients from two regions of Palestine, 91 (14.2%) were identified as having AEs.

Inter-rater reliability

The inter-rater reliability between the two primary reviewers was moderate ($\kappa = 0.58$, 95% CI). The reliability between the final review conducted by the primary review team (the two nurses and the physician) and the secondary reviewer was almost perfect ($\kappa = 0.89$; 95% CI) [17].

Incidence and preventability of adverse events

From the first 640 randomly selected records, 30 records (4.7%) could not be retrieved. To avoid affecting the AE rate, we selected another 30 records using the same randomization method to reach the final number of 640. According to the reviewers' comments, unavailability of medical records might be due to lack of proper medical records management [13]. In the primary records review, 1291 triggers were identified. Records identified with triggers were eligible for retrospective review. A total of 501 (38.8%) of these triggers were identified in 93 cases (14.5%) with an AE. The review team of the second-stage review reduced the number from 93 AEs to 91 AEs. Only four of these AEs were captured in voluntary reporting before our study was conducted.

Our retrospective review revealed that 91 hospitalized patients (14.2%) experienced one or more AEs. Of the AEs, 54 (59.3%) were highly preventable. The highest AE incidence rates were in internal medicine: 37 AEs occurred in 160 hospitalized patients (23.1%). Of these, 25 (67.6%) were preventable (Table 1). Furthermore, 15 (68.2%) of AEs in obstetric services were preventable. By reviewing the types of AEs, we determined that 25 (27.5%) of all AEs were related to surgical

Table 1 Frequency of adverse events (AEs) and percentage of preventable AEs per department

Admission department	No. of records reviewed ($N = 640$)	AEs per 100 admissions[a] (%)	Preventable AEs per department AEs (%)
Surgical	160	21 (13.1)	10 (47.6)
Obstetric	160	22 (13.8)	15 (68.2)
Orthopedic	160	11 (06.9)	04 (36.4)
Internal medicine	160	37 (23.1)	25 (67.6)
Total	640	91 (14.2)	54 (59.3)

[a]AEs per 100 admissions = (total AEs/total records reviewed) × 100.

Table 2 Type of AEs, percentage of preventable AEs per type, percentage of permanent patient harm and percentage of interventions required to sustain life for each type

AE types	Frequency of AE type, $N = 91$(%)	Preventable AEs per AE type (%)	Harm category F per AE type (%)	Harm category H per AE type (%)
Surgical procedures	25 (27.5)	07 (28.0)	13 (52.0)	02 (08.0)
Prenatal AEs	20 (21.9)	15 (75.0)	15 (75.0)	00 (00.0)
Infection	17 (18.7)	09 (52.9)	15 (88.2)	01 (05.9)
Medication-related events	14 (15.3)	11 (78.6)	07 (50.0)	01 (07.7)
Pulmonary/DVT	13 (14.3)	10 (76.9)	12 (92.3)	00 (00.0)
Pressure Ulcers	02 (02.3)	02 (100.0)	02 (100.0)	00 (00.0)
Total	91 (100.0)	54 (59.3)	64 (70.3)	04 (04.4)

DVT, deep vein thrombosis; F, temporary harm to patient who required prolonged hospitalization; H, harm to the patient required intervention to sustain life.

Table 3 Frequency of AEs and percentage of preventable AEs per harm category

Harm category	AEs per harm category (%)	Preventable AEs per harm category (%)
E: temporary harm to patient who required intervention	22 (24.2)	9 (40.9)
F: temporary harm to patient who required prolonged hospitalization	64 (70.3)	41 (64.1)
G: permanent harm to patient	1 (1.1)	1 (100.0)
H: harm to patient required intervention to sustain life	4 (4.4)	3 (75.0)
Total	91 (100.0)	54 (59.3)

procedures. Almost all AEs were related to pressure ulcers, medication, pulmonary/deep vein thrombosis or prenatal AEs, which are highly preventable (Table 2).

Gender analyses revealed that 65 (71.4%) of AEs occurred in female patients. More than half of these were prenatal and surgical events (23 [35.4%] and 18 [27.7%], respectively). Moreover, 44 (67.7%) were classified as harm category F and 37 (56.9%) were preventable.

Table 3 shows the percentage of AEs and preventable AEs per harm category. Sixty-four (70.3%) of all AEs caused temporary harm and required prolonged hospitalization (harm category F). Of these, 41 (64.1%) were considered preventable. Moreover, four AEs (4.4%) required intervention to sustain life.

Table 4 presents the proportion of preventable AEs and their harm severity. The frequency of AE increased with patient age and length of stay.

Discussion

This is the first objective study to assess patient safety levels in Palestine through the systematic review of patient medical records. This study demonstrates that reviewing and monitoring AEs is feasible. We found that one out of every seven patients (91 [14.2%]) suffers harm. Of the AEs, 54 (59.3%) were highly preventable, 25 (27.5%) were related to surgical procedures and 20 (21.9%) were prenatal. Moreover, 64 AEs (70.4%) caused temporary harm, requiring prolonged hospitalization, and 4 AEs (4.4%) required interventions to sustain life. For inter-rater agreement regarding AEs, a good level of reliability was observed among the independent reviewers, similar to that of other studies [18, 19].

Our study provides some insight in understanding AE rate and harm categories in this specific context. However, our study identified conditions that possibly could make using the IHI-GTT difficult in this particular setting. For example, the reviewers noticed that the structure and quality of the records were not homogeneous. In addition, some of the medical records were incomplete and underreported. Moreover, owing to local cultural issues, the team of reviewers could not review the medical records of deceased patients, even though AEs can contribute to death.

By comparing the rate of AEs with that of other studies, we found that our results are close to those reported previously [20, 21] Furthermore, the preventable level of harm and types of harm are similar to those of studies conducted in other health care settings [8–10, 18, 22–27]. However, the observation that the medical records were less comprehensive and comparison of our results with other studies using the same method [5, 7, 14] suggest the possibility that the AE rate we observed is an underestimate. The main factors that may have contributed to this underestimation are (1) necessity of excluding deceased cases and (2) counting and analyzing only the most serious event in cases having several AEs. Despite the likelihood of underestimation, we obtained much more objective AE data using the IHI-GTT than that generated by the voluntary reporting system of the two hospitals. Only 4 of the 91 AEs we

Table 4 Frequency of AEs and percentage of preventable AEs per age category

Age category	No. of reviewed records per age category	Frequency of AEs per age category (%)	Preventable AEs per age category (%)	Frequency of harm category F per age category (%)	Frequency of harm category H per age category (%)
≤20	64	5 (7.8)	4 (80.0)	1 (20.0)	0 (0.0)
21–40	264	29 (10.9)	17 (58.6)	23 (79.3)	0 (0.0)
41–65	185	28 (15.1)	19 (67.9)	22 (78.6)	2 (7.1)
66–79	107	25 (23.4)	11 (44.0)	15 (60.0)	0 (0.0)
≥80	20	4 (20.0)	3 (75.0)	3 (75.0)	2 (25.0)
Total	640	91 (14.2)	54 (59.3)	64 (70.3)	4 (04.4)

F, temporary harm to patient who required prolonged hospitalization; H, harm to patient required intervention to sustain life.

identified were also captured using voluntary reporting. Hence, relying on voluntary reporting might lead to inaccurate conclusions and thus inappropriate or less effective efforts aimed at improving patient safety in similar health care systems [5, 16]. This is especially the case when AEs are assessed in a culture where an individual's errors receive more attention than system failures [28–30]. Indeed, reporting events voluntarily could cause serious problems for the reporter.

Many authors of previous studies highlight the key role of generating safety data in enhancing patient safety: learning from mistakes and implementing interventions to reduce the likelihood of injury to future patients [22]. Our study is novel because it was conducted in a country with limited resources. Indeed, it is the first such investigation. It might encourage and inform other developing and transitional economies countries (1) to start working on monitoring and improving patient safety and (2) to improve the quality of medical records documentation, as advocated by Wilson *et al.* [13]. Our results represent a first step in providing objective evidence to policymakers and leaders in Palestine for the purpose of guiding major initiatives aimed at improving health policy, planning and resource allocation [13]. It should also be useful for leaders marshaled to advance similar health care systems in other developing nations.

Future implications

Our study elevates awareness for careful monitoring of surgical procedures, prenatal procedures and the use of best medical care practices. There is a clear need to train leaders with expertise in quality health care and patient safety. They need to be educated on seeing the benefits of obtaining more evidence and data for rational decision making.

A high percentage of AEs required prolonged hospitalization. This should motivate hospital management to implement interventions that minimize AEs, thereby diminishing undesirable costs of services associated with AEs. In addition, medical records and event reporting must be improved, and hospital management needs to focus on system failures rather than the errors of individuals. Continuing education on implementing best practices, standards and protocols might support improvement initiatives.

Limitations

This study was confronted with several limitations. First, our budget was very limited, meaning that we could study only two Palestinian hospitals. Thus, our results cannot be directly generalized to all Palestinian hospitals. However, these two hospitals have a good reputation; one of them is a referral teaching hospital. The second limitation relates to the determination of the preventability of AEs and additional length of stays attributed to AEs, which were not based on the use of a scale. These depended largely on the reviewers' opinions and interpretation. Finally, given the lack of a golden standard for detecting AEs in those hospitals, it was impossible for us to assess the sensitivity, specificity or positive predictive values of the IHI-GTT in this context.

Conclusions

The present study demonstrates that AE monitoring is feasible in countries with limited resources, like Palestine. Health care authorities and hospital management should exert increased effort to encourage continuous monitoring of AEs. As safety problems are a serious concern in modern health care delivery, we argue that direct interventions should be started immediately to improve safety and to avoid additional costs generated by AEs. Future research will extend this exploratory study by carrying out similar research in other hospitals in Palestine, by rigorously studying factors contributing to AEs, and by implementing appropriate interventions to decrease the risk of harm and their additional costs.

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Appendix

Worksheet 1: Palestinian version of the Institute of Healthcare Improvement Global Trigger Tool (IHI-GTT) for measuring adverse events

Care module triggers		+ Event description and harm category (E-I)	Medication module triggers		+ Event description and harm category (E-I)
C1	Transfusion or use of blood products		M1	*Clostridium difficile* positive stool	
C2	Code/arrest/rapid response team		M2	Partial thromboplastin time greater than 100 seconds	
C3	Acute dialysis		M3	International Normalized Ratio (INR) greater than 6	
C4	Positive blood culture		M4	Glucose less than 50 mg/dl	
C5	X-ray or Doppler studies for emboli or deep vein thrombosis (DVT)		M5	Rising blood urea nitrogen (BUN) or serum creatinine greater than 2 times baseline	
C6	Decrease of greater than 25% in hemoglobin or hematocrit		M6	Vitamin K administration	
C7	Patient fall		M7	Benadryl (Diphenhydramine) use	
C8	Pressure ulcers		M8	Romazicon (Flumazenil), ***Anexate, Mazicon*** use	
C9	Readmission within 30 days		M9	Naloxone (Narcan) ***Nalone, Narcanti*** use	
C10	Restraint use		M10	Antiemetic use	
C11	Health care-associated infection		M11	Over-sedation/hypotension	
C12	In-hospital stroke		M12	Abrupt stop of medication	
C13	Transfer to higher level of care		M13	***Skin rash***	
C14	Any procedure complication		M14	***Other***	
C15	Other				
Surgical module triggers			**Intensive care module triggers**		
S1	Return to surgery		I1	Pneumonia onset	
S2	Change in ***anesthetic or procedure during surgery***		I2	Readmission to intensive care	
S3	Admission to intensive care post-op		I3	In-unit procedure	
S4	Intubation/reintubation/ BiPap in Postanesthesia Care Unit (PACU)		I4	Intubation/reintubation	
S5	X-ray intra-op or in PACU				
S6	Intra-op or post-op death		**Prenatal module triggers**		
S7	Mechanical ventilation greater than 24 hours post-op		P1	Terbutaline use	
S8	Intra-op epinephrine, norepinephrine, naloxone, or romazicon		P2	3rd- or 4th-degree lacerations	
S9	Post-op troponin level greater than 1.5 ng/ml		P3	Platelet count less than 50000	

(*continued*)

Continued

Care module triggers	+ Event description and harm category (E-I)	Medication module triggers	+ Event description and harm category (E-I)
S10 Injury, repair, or removal of organ		P4 Estimated blood loss > 500 ml (vaginal) or > 1000 ml (C-section)	
S11 Any operative complication		P5 Specialty consult	
S12 ***Consult request post-anesthesia***		P6 Oxytocic agents	
		P7 Instrumented delivery	
		P8 General anesthesia	
		P9 ***Maternal/neonatal transport/ transfer***	
		Emergency department (ED) module triggers	
		E1 Readmission to ED within 48 hours	
		E2 Time in ED greater than 6 hours	

* **Italic & Bold**: Adjustments to Palestinian context
Patient Identifier _____ Total Events _____ Total LOS _____.
Write descriptions of the events in greater detail on reverse of Worksheet. [Opposite side is blank for notes].