Incidence des évènements indésirables graves dans un service de médecine interne: étude rétrospective de 500 dossiers médicaux

The incidence of serious adverse events in a Tunisian hospital: a retrospective medical record review study

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RÉSUMÉ

But : Etudier l'épidémiologie des événements indésirables grave (EIG) observés dans le service de médecine interne de l'hôpital universitaire Mongi Slim de la Marsa, en analyser les causes et les facteurs favorisants, les confronter avec les données de la littérature et d'établir les stratégies susceptibles de les prévenir quand ces événements étaient jugés évitables.

Méthodes : Il s'agit d'une étude rétrospective ayant colligé les dossiers médicaux de 500 hospitalisations de références tirées au sort. Elle a adopté la méthodologie de travail du projet EMRO/OMS sur la mesure des événements indésirables. La revue des dossiers a été faite en deux temps. Une première étape destinée à « dépister» les hospitalisations où un EIG était susceptible d'être survenu puis une deuxième étape dont le but était de confirmer la présence de l'EIG, d'en déterminer le type et le caractère évitable ou pas.

Résultats : Nous avons trouvé une incidence d'EIG de 5,2% avec un taux d'évitabilité de 57,69%. Ces événements ont été responsables d'une prolongation de 27% des hospitalisations et d'une incapacité dans 15,4% des cas. Ils étaient le motif d'admission de 42,85% des hospitalisations où un EIG a été retenu. Concernant la nature des EIG, il s'agissait d'événements indésirables médicamenteux dans 73% des cas, d'infections liées aux soins dans 19% des cas, de procédures non chirurgicales dans 4% des cas et de complications de décubitus dans 4% des cas.
L'âge et le nombre de co-morbidités ont été identifiés comme les principaux facteurs de risque de survenue des EIG.

Conclusion : Une prise de conscience de l'ampleur et de la gravité du problème de l'iatrogénie s'impose car c'est une condition sine qua non à l'instauration d'une culture de sécurité des patients parmi nos personnels soignants.

Mots-clés
Evénement indésirable grave, iatrogénie, sécurité des patients, erreur médicale, infection liée aux soins, événement indésirable médicamenteux

SUMMARY

Aim : To describe the epidemiology of serious adverse events (SAE) reported in the division of internal medicine at the Mongi Slim university hospital in Tunis, to analyze their causes and contributing factors and compare them to that reported in literature so as to establish prevention strategies when these events were deemed preventable.

Methods This retrospective study collected the medical records of randomly selected 500 index hospitalizations. Records review was conducted in two stages: a primary review that aimed to detect hospitalizations where a SAE was likely to have occurred then a secondary review which purpose was to confirm the presence of the SAE, to determine its nature and its preventability.

Results : SAE were detected in 5.2% of hospitalizations with a preventability of 57.7%. These events were responsible for a prolongation in 27.0% of hospitalizations and disability in 15.4% of cases.
They were the cause of admission in 42.9% of hospitalizations in which a SAE occurred. The SAE consisted in adverse drug events in 73.0% of cases, healthcare-associated infections in 19.0% of cases, non-surgical procedures in 4% of cases and pressure ulcers in 4.0% of cases. Age and number of comorbidities were identified as the main risk factors for the occurrence of SAE.

Conclusion : Awareness of the extent and severity of the problem of iatrogenesis is necessary because it is a prerequisite to establishing a culture of patient safety among caregivers.

Key-words
Serious adverse events; iatrogenesis; patient safety; medical errors; healthcare-associated infections; adverse drug events.

Articles devoted to iatrogenesis abound in the medical literature as well as in non-medical media. Examples are various ranging from nosocomial infections to adverse drug events, falls, surgical site errors or mistaken patients identity.

Iatrogenesis takes a heavy toll on human lives not to mention its economic burden.

The 1999 Institute Of Medicine (IOM) report "To err is human" estimated that 44 000 to 98 000 deaths per year in the U.S. were iatrogenic and most were due to errors that could have been prevented [1]. This report had strong echoes in the press and launched a debate on "medical errors", contributing significantly to the development of the "patient safety" concept.

Noting that few studies have attempted to assess the overall impact of iatrogenesis in Tunisian hospitals, we were interested in evaluating its real impact in a university hospital division, using serious adverse events (SAE) as an assessment tool.

The aim of this work was to study the epidemiology of SAE observed in this division through the review of 500 medical records, to analyze their causes and contributing factors and to compare this data with that from the literature to establish preventing strategies when the events were deemed preventable.

PATIENTS AND METHODS

This is a retrospective observational and descriptive study conducted in the division of internal medicine at the Mongi Slim university hospital in Tunis, over a period of 11 years and a half (from January 1998 to end June 2010).

This study used the methodology of the Eastern Mediterranean Regional Office (EMRO) of the World Health Organization (WHO) project to measure adverse events. This methodology was adopted during a training workshop on implementation of patient safety plans of action, convened at the WHO Regional Office for the Eastern Mediterranean in Cairo on 8 May 2006. The workshop represented the continuation of a previous one held at the same location in December 2005. Its central goal was assessing the magnitude of patient harm in the Region and developing the keystones of a framework that organizes a patient safety program [2].

500 medical records were randomly selected, using computer software, from the internal medicine division database. This database lists all the hospitalized patients in the division since 1997 and contains records numbers, hospitalizations dates and medical coding according to ICD-10 (International Classification of Diseases, 10th revision).

The size of the studied sample was set at 500 hospitalizations from a total of 8932 between January 1998 and June 2010. This figure was calculated to correspond to a representative sample, according to the following formula:

$n= 2*[t^2 . p (1-p)]/ m^2$; t : confidence level of 95% (typical value 1.96) ; p : estimated prevalence (20%) ; m : margin of error of 5% (typical value 0.05).

The 500 randomly selected records matched with 500 index hospitalizations that occurred over the study period. It was therefore possible that an already selected record was drawn again, provided it was a different hospitalization. The records review process consisted of two phases. The primary review was an initial screening stage that aimed to determine whether the index hospitalization met one or more of 18 explicit criteria. The records that screened positive were eligible for a secondary review in which, whether it met or not a precise definition, the presumed SAE was confirmed or denied. In case a SAE was confirmed, we specified its classification and context of occurrence and estimated its preventability. Both reviews were performed by the same physician.

Two review forms were used (see appendix 1 and 2 on bmj.com) [3]. The first review form (RF1) included the following information:

- The patient demographics
- The duration of the index hospitalization
-A clinical summary
- The number of patient comorbidities and their nature; smoking and alcoholism were considered as comorbidities.
- 18 criteria for generic or specific situations to identify potential SAE.

The interviewer was required to answer "yes" (applicable criterion) or "no" (not applicable criterion) to each of these items.

The second review form (RF2) consisted of several sections: clinical summary, identification and classification of adverse events, disability, adverse events clinical context, contributing factors and preventability.

Statistical analysis

Records were randomly selected from an Access® database that allows the creation of secured input masks as well as statistical analysis through queries directly exported to statistical analysis software.

The statistical analysis software we used were Epi Info 2000 (version of January 2011) and SPSS version 17.

A $p \leq 0.05$ was considered statistically significant with a confidence index of 95%. Means were compared using unpaired Student's t-test and / or variance analysis when conditions of application were met. Otherwise, we used non-parametric tests, especially the Kruskal-Wallis test.

Proportions were compared using the Chi2 test when conditions of application were met otherwise we used the Fisher's exact test.

RESULTS

Among the 500 patients, 196 (39.2%) were male and 304 (60.8%) female. The average age was 51.5 ± 18 years with extremes of 15 and 86 years. Patients over 65 years accounted for 26.8% (134/500) of the total study population with a mean age of 73 ± 5.7.

We found a total number of 26 SAE which corresponds to an incidence of 5.2% (Table 1) and an incidence density of 5.01 SAE per 1000 patient-days. Preventability rate was 57.7%. The SAE consisted in adverse drug events (ADE) in 73% of cases (19 cases), healthcare-associated infections in 19% of cases (5 cases), non-surgical procedures in 4% of cases and pressure ulcers in 4% of cases. No case of fall was found.

Incidence of ADE was 3.8% (19 cases). 42.0% were deemed preventable. The main implicated drug classes were anticoagulants (vitamin K antagonists and low molecular weight heparin): 21.0% (4

cases), antidiabetic agents (oral antidiabetics and insulin): 15.9% (3 cases), antibiotics: 15.9% (3 cases) and other cardiovascular disease drugs (acebutolol, amiodarone): 21.0% (4 cases).

Table 1: Number of records that underwent primary (RF1) and secondary (RF2) review, number of potential adverse events and number of adverse events

Total sample	Primary screen (RF1)		Secondary screen (RF2)		Adverse event rate/admission
	No in sample	No (%) positive	No in sample	No (%) positive	
8932	500	26	26	26	5.2

The average age of patients with a SAE was 55 ± 21.3 years with extremes ranging from 17 to 86 years. They were older, but in a non-significant way, than patients who did not present SAE, whose average age was 51 ± 17.9 years (p = 0.37).
However, the percentage of SAE was significantly higher (p = 0.05) in patients aged 65 years and over (9 of 134 cases or 6.7%) than in those under 65 years (12 cases of 366 or 3.3%).
The average number of comorbidities in patients with SAE was 3.8 ± 1.9. It was significantly (p = 0.03) higher than that calculated in patients who did not have a SAE (2.9 ± 1.7).
Drug intake was significantly higher (p <0.01) in patients with a SAE (13/21 or 61.9% were taking at least one drug versus 320 of 479 or 66.8% among those who did not have a SAE). The percentage of ADE was almost equal in patients under 65 years (9 in 19 ADE or 47.4%) and those aged 65 and over (10 in 19 ADE or 52.6%).
The mean hospitalization duration of patients with a SAE was 10.1 ± 11.9 days. It was higher than that of patients who did not have a SAE (10.3 ± 6.5 days) but in a non-significant way (p = 0.33).
SAE were responsible for the prolongation of 27% of hospitalizations. The duration of this extension could not be estimated. They were the reason for admission in 42.9% of hospitalizations in which they occurred; 44.4% of these admissions were considered preventable.
SAE led to a disability in 15.4% of cases. They were however responsible of no death.

DISCUSSION

A 5.2% incidence of SAE was found in patients hospitalized in the internal medicine division at the Mongi Slim university hospital in Tunis over the period January 1998 to end of June 2010.
Data from the literature are unanimous on the fact that a significant percentage of hospitalizations leads to SAE. However, SAE incidences are highly variable from one study to another, ranging from 2.9 to 16.6% [4-10]. Even if it is within the range of incidences of SAE reported in the literature, the figure of 5.2% we found remains relatively low. Two main hypotheses could explain this:
• The fact that the division concerned with the study is a medical specialty division makes the incidence of SAE lower than that observed in some other divisions especially surgery divisions and intensive care units.
• An underestimation of the incidence of SAE in the division related to:
- An under-reporting of these events. It may be unintentional, due to a lack of systematic data collection on the part of doctors or nurses (SAE considered minor such as phlebitis, psychological harm, falls without physical consequences...) or voluntary concerning SAE with heavier consequences for fear of reprimand or possible disciplinary and legal measures. This under-reporting reflects a poor culture of patient safety in health care workers since the declaration of a SAE remains more associated with the fear of punishment than with the will of optimizing healthcare quality.
- An under-diagnosis of SAE from medical records. Indeed, the occurrence of SAE is not always explicit in the records. Their detection is therefore highly dependent on investigators judgment and varies considerably depending on their experience, their number and the confidence degree they express toward the found results and the quality of medical records [5].
The records review guide we used preconized that the primary review (RF1) had to be performed by nurses or junior doctors whereas the secondary (RF2) had to be performed by a senior physician. But in our study, both reviews were performed by the same physician.
It would have been interesting to involve two physicians per patient record instead of one which would have led to more reported adverse events [11]. However, the inter-rater agreement of record review to assess adverse events is not improved by involvement of two independent physician reviewers per patient record including a consensus procedure in case of disagreement [11].
Two main factors favoring the occurrence of SAE were identified in our study: the age and the number of comorbidities.
SAE were more frequent in patients aged over 65 years than in young adults (6.7% versus 3.3%, p = 0.05). The average age of patients who had a SAE was also higher than that of patients who did not have one but this difference was not significant (p = 0.37). This greater frequency of SAE in patients over 65 years has been reported by many studies [4-6].
The number of comorbidities was higher among patients with a SAE (3.8 ± 1.93 versus 2.9 ± 1.69, p = 0.0049).
The length of hospital stay did not appear to be a factor favoring the occurrence of SAE, contrary to what is reported in literature data. In fact, patients with a SAE had a longer duration of hospitalization but in a non-significant way. SAE preventability rate of 57.7% we found is higher than figures of most studies that range from 35.4 to 51.0% [5, 7-10, 12]. Only the Swedish study of 2009 [13] found a preventability rate higher than 70%. We believe that in our study, as in the Swedish one, this high rate is due to a hindsight bias that probably led to an overestimation of preventability.
73% of SAE in our study were drug-induced. This high prevalence of ADE seems logical, since the study was conducted in an internal medicine division where drug prescription is at the center of care activity and where interventional procedures are quite limited. ADE represented 19% of total SAE in the Harvard Medical Practice Study [4] and 26% in the Australian study on ADE [14]. These proportions may be lower than ours because the two precited studies involved several hospitals with various types of divisions (surgery, intensive care ...), which probably reduced the proportion of ADE in favor of other types of SAE. In our study, 42% of ADE were judged

preventable. This proportion was related to prescribing errors or to a drug misuse due to patient's lack of education toward treatment intake and precautions it requires.

The proportion of ADE considered inevitable (58%) is due to mechanisms such as adverse drug reactions, idiosyncrasy or unknown allergy to a given product. The anticoagulants (vitamin K antagonists and low molecular weight heparin) were, alone, responsible for 21% of ADE. Similar results have been reported by many studies that recognize anticoagulants as one of the therapeutic classes that are most responsible for ADE and hospitalizations especially in the elderly [14-17].

Nosocomial infections accounted for 19% of SAE identified in our study, which corresponds to an incidence of 1%. This figure is much lower than those reported in the literature. The French national survey on nosocomial infections prevalence in 2006 [18] found an incidence of 5.25%, the Swiss national survey in 2003 found an incidence of 5.6% [19] and the Tunisian National Survey in 2005 [20] found an incidence of 5.2%. This underestimation may be explained again by the phenomenon of under-reporting in the medical records. The prevalence of nosocomial infections is correlated with hospitals bed capacity [21, 22]. It is thus higher in university hospitals that, more frequently than other institutions, host immunocompromised patients or patients with severe co-morbidities [22, 23].

It also varies according to the type of medical divisions. The rate of nosocomial infections in intensive care units remains the highest, ranging from 11.4% to 67% [18, 19, 22]. This is due to intrinsic risk factors in hospitalized patients (severity and high number of co-morbidities, long hospital stays) but also extrinsic risk factors i.e. invasive medical techniques (mechanical ventilation, parenteral nutrition, catheterization...).

A single case of pressure ulcer was found in the 500 reviewed hospitalizations (4%). It was due to the absence of prophylaxis in an immobilized and malnourished 86-year-old patient. This rate is again likely to be underestimated since the prevalence of hospital-acquired pressure ulcers reported in the literature ranges from 3 to 66% [24]. But this low rate could also be partly explained by the fact that we associate patients' relatives in nursing care. The active involvement of informal caregivers also improves management at home especially in the case of geriatric patients.

No case of fall was found. We believe that this result does not reflect the real situation in the division and that it is due to an under-reporting of falls in medical records, especially falls that did not have physical consequences or which physical consequences were minimal.

In a multicenter British study conducted in 2001/2002 by the National Patient Safety Agency, falls accounted for 41% of incidents voluntarily reported [25]. This confirmed the findings of Sutton et al in 1994 that falls accounted for the most frequent accidents (69.6%) among hospitalized patients [26]. Paradoxically, in the Harvard Medical Practice Study, Brennan et al found that falls accounted for only 2.1% of all SAE observed [4]. This great disparity in figures can be explained by differences in methodologies used by these studies and discrepancy on what was actually assessed. Indeed, the definition of fall adopted by the WHO as "an event dropping the subject land against their will" has sometimes been neglected in these studies in favor of other definitions.

This variety can also be explained by the heterogeneity of institutions and departments in which falls were evaluated. Thus, fall frequency ranges from 1.3 per 1000 patient-days in a multidisciplinary university hospital [27] to 19.2 falls per 1000 patient-days in the geriatrics division of a short stay hospital [28].

In our study, no deaths linked to SAE were reported. However, SAE were responsible for significant morbidity with a stay prolongation in 27% of hospitalizations and disability in 15.4% of cases. They also motivated 42.9% of hospitalizations in which a SAE occurred.

This morbidity has direct costs, especially those of hospital stay prolongation, transportation and lodging for patients and / or their relatives. It also has indirect costs associated with work stoppages and patient reduced productivity. Thus, the annual direct medical costs of SAE in Dutch hospitals were estimated in 2004 at 355 million Euros of which 161 due to avoidable SAE. This amount represents a substantial proportion (1%) of the national health care budget in the Netherlands [29].

Identifying and preventing SAE would thus help overcoming some financial difficulties faced by health care systems especially in emerging countries such as Tunisia, and would enable the mobilization of these resources to promote other public health goals.

CONCLUSION

The results of this study reflect the situation in the internal medicine division of a Tunisian university hospital over the period 1998-2010. Since then, a number of initiatives and actions aiming to improve patient safety have been adopted in this division. It would be interesting to assess the impact of these measures on the incidence of SAE through a prospective study and to conduct a multicenter and even national study so that to compare Tunisian data to that available in other countries. This would be a further step in the promotion and anchoring of patient safety culture in our country.

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