Patient safety and medical errors: knowledge, attitudes and behavior among Italian hospital physicians

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Abstract

Objective. To investigate physicians’ knowledge about evidence-based patient safety practices, their attitudes on preventing and managing medical errors and to explore physicians’ behavior when facing medical errors.

Design. A nationwide cross-sectional survey.

Setting. We first stratified our population by the 20 Italian regions. Then, within each stratum, we selected by simple random sampling, for each region, one regional general hospital and one district general hospital to yield a sample of 40 hospitals overall.

Participants. Twelve hundred physicians involved in direct patient care (30 per hospital) were sent a survey by mail and 696 responded.

Main Outcome Measures. Knowledge on patient safety practices, attitudes and practices toward the prevention of medical errors.

Results. Physicians’ knowledge of evidence-based safety practices was inconsistent. More than 90% of physicians reported that counting surgical items during an invasive surgical procedure represented a patient safety practice. Positive attitudes about patient safety were revealed by responses, but 44.5 and 44.1%, respectively, agreed or were uncertain about the disclosure of errors to the patients. The pattern of behavior showed that 7.6% of physicians reported to have never been involved in medical errors, and among system failures, ‘overwork, stress or fatigue of health professionals’ was the most highly rated item.

Conclusions. The results from our study highlight that greater efforts are needed to facilitate the translation of positive attitudes towards patient safety into appropriate practices that have proven to be effective in the reduction of medical errors.

Keywords: Italy, medical errors, physicians, risk management

Introduction

Despite increased attention to patient safety and healthcare quality, errors and adverse outcomes are still frequent in clinical practice. Although it is difficult to obtain reliable estimate of errors, there is now international consensus that ~10% of hospitalized patients suffer injuries related to medical management and at least half of these are preventable adverse events [1–3]. Understanding the main contributing factors to medical errors and identifying effective interventions to reduce them are essential to improve patient safety. The introduction of the ‘culture’ of safety into healthcare organization is one aspect of patient safety that is expected to significantly contribute to improving patient safety. Safety culture has become a significant issue for healthcare organizations striving to improve patient safety, and some safety investigations have indicated that organizations need to change their culture to make it ‘easy to do the right thing, and hard to do the wrong thing’ for patient care [4]. Recent studies assessed the safety culture in different types of healthcare organizations and hospital safety culture has been linked to patient safety [5–7].

Assessment of current safety culture in a healthcare organization is the first step to identify the most problematic areas for improvement [8], since healthcare staff knowledge, attitudes and pattern of behaviors are critical in the promotion of the workplace climate needed to secure an organizational culture of safety. Although this issue has been addressed in
many healthcare settings [5–7], very few data are available in Italy:

The purposes of the present study are to investigate physicians’ knowledge about evidence-based patient safety practices, to evaluate their attitudes on preventing and managing medical errors, to estimate reported frequency of errors, their perceived causes and possible solutions and to explore physicians’ behavior when facing medical errors.

Methods

Study population

This national cross-sectional survey was conducted performing a multi-stage sampling. To enable the sample to better represent Italian hospital physicians’ characteristics, we first stratified our population by the 20 Italian regions. Then, within each stratum, we selected by simple random sampling one regional general hospital and one district general hospital. Regional hospitals have an autonomous direction/management and provide highly specialized health care, whereas district hospitals, which are steered by Local Health Units, provide a high-standard but a lower complex level of care. Subsequently, management staff of the selected hospitals was contacted by phone in order to explain the purposes of the study and, accordingly, to have a verbal consent to carry out the study in their institution. In case of refusal, we randomly drew an analogous type of hospital setting within the same region, with the methodology described above, and so forth, until consent was reached. For each of the 40 hospitals that agreed to participate, 30 questionnaires were mailed along with a numbered roster of physicians (excluding those not involved in direct patient care such as pathologists and laboratory physicians) and instructions for selecting 30 physicians at random. Overall, this protocol yielded a stratified sample of 1200 physicians.

Review instrument

The questionnaire was divided into sections and comprised a series of items pertaining to socio-demographic and practice characteristics. Then, the definition of medical error based on the Institute of Medicine (IOM) definitions [9], ‘a failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim’, was provided before physicians answered to the items in subsequent questionnaire sections. Physicians’ knowledge regarding interventions that had been proved to be effective in the reduction of clinical errors was investigated by using five items: three were obtained from the Agency for Healthcare Research and Quality (AHRQ) report [10] and reported interventions of proven effectiveness (‘limiting certain high-risk procedures to high-volume centers’, ‘increasing the number of nurses in hospitals’, ‘counting surgical items during an invasive surgical procedure’). Analogously, two items were derived from the study of Rosen et al. [11] and reported interventions of unproven effectiveness (‘giving physicians more time to spend with patients’ and ‘encouraging hospitals to report serious medical errors voluntarily to a state agency’). Questions on attitudes towards management and reporting of medical errors (six items) were mainly drawn from Wu et al. paper [12] and respondents were asked to use a three-point scale ‘agree/uncertain/disagree’. Potential causes of medical errors were presented in a list of 10, and items were mainly drawn from Vincent et al. paper [13]. Frequency of involvement in medical errors was rated on a four-point Likert scale from never to frequently, outcomes on a five-point Likert scale from never to always, perceived cause of error in a list of 10 and the subsequent behavior to medical error in a list of six. Finally, physicians were asked about their judgment on effectiveness of prevention of medical error strategies implemented in their own practice setting, judgment on their own knowledge in error prevention and on improvement of their own knowledge on error prevention (Supplementary material, Appendix).

The original version of the questionnaire was pilot tested and revised before distributing to the study sample.

The study was approved by the Institutional Ethical Committee (‘Mater Domini’ Hospital of Catanzaro, Italy, study number 2006/7).

Statistical analysis

Stepwise multiple logistic regression models with backward elimination were used to identify characteristics that predicted the outcomes of interest. Three models were developed including those independent variables that were considered potentially associated with the following outcomes: knowledge of the evidence of the interventions’ effectiveness (Model 1); attitude towards the management and reporting of medical errors (Model 2); the frequency of involvement in medical errors (Model 3). The following predictor variables were included in all models: gender, age, years since graduation, head physician vs. all other, type of clinical practice, ward of practice, hospital size expressed as the number of beds, having received risk management training, type of hospital setting, judgment of risk management interventions’ effectiveness in their own practice setting, judgment of their own knowledge in error prevention, need of their own knowledge improvement on error prevention. In Model 2 we also included the independent variable knowledge of the evidence of the interventions’ effectiveness. Model 3 included the following further independent variables: knowledge of the evidence of the interventions’ effectiveness and attitude in management and reporting of medical errors. Response categories for each variable are reported in Table 1.

A crucial aspect of using stepwise logistic regression is the choice of an ‘alpha’ level to judge the importance of variables, and the choice of $P = 0.05$ has been shown to be too stringent. Therefore, a value of $P$ in the range of 0.15–0.20 is recommended for variable inclusion, and of 0.20–0.40 for variable removal [14]. Therefore, we set at $P = 0.2$ the significance level for including and at $P = 0.4$ for dropping variables from the models. Association between the characteristics and outcomes was expressed by adjusted odds ratios (ORs) and 95% confidence intervals (CIs) of the adjusted
Results

Of 1200 mailed, a total of 696 surveys were returned giving an overall response rate of 58%. The main demographics and practice characteristics of the study population are presented in Table 1.

Physicians’ knowledge on evidence-based patient safety practices

Table 2 summarizes the data concerning the level of knowledge of evidence-based patient safety practice interventions and, surprisingly, the item that generated the highest agreement (90.2%) was about the effectiveness of counting surgical items during an invasive surgical procedure, whereas the lowest agreement (60.5%) was reported for the statement that medical errors would be less likely at a hospital that performs a high volume of procedures. The highest uncertainty (24.8%) was registered for increasing the number of nurses in hospitals, whereas an unexpected high percentage of physicians (78.5%) believe that encouraging hospitals to report medical errors voluntarily to a state agency could be effective in reducing the number of medical errors. Results of stepwise multiple logistic regression analysis indicated that the number of years elapsed since graduation was the only variable significantly associated with the knowledge of evidence-based patient safety practices (Model 1 in Table 3).

Attitudes about reporting and disclosure of medical errors

Moreover, Table 2 shows physicians’ attitudes about management, disclosure and reporting of medical errors. Positive attitudes were revealed by responses to almost all items on reporting of medical errors, since the agreement ranged from 98.4% to the statement that physicians should discuss with colleagues on medical errors that occurred during clinical management to 87.6% for the statement that reporting medical errors to one’s institution could improve the quality of care for future patients. In contrast, 44.5 and 44.1%, respectively, agreed or were uncertain about the disclosure of errors to the patients. Positive attitudes were significantly higher for those practicing in medical specialties areas and in intensive care unit/emergency department areas when general medicine was chosen as the reference category. Moreover, a positive attitude was significantly predicted by a lower number of years elapsed since graduation and an older age (Model 2 in Table 3).

Physicians’ involvement in and perceived causes of medical errors

Physicians were questioned about the frequency of their involvement in medical errors and they reported to have been involved, ‘never’ in 7.6%, ‘rarely’ in 61.4%, ‘sometimes’ in 30.3% and ‘frequently’ in 0.7% of cases. Respondents usually attributed medical errors to more than one cause [16] (Table 4). Among system failures, ‘overwork, stress or fatigue of health professionals’ was the most rated item, while ‘health professionals poorly skilled or experienced’ was the most rated item among causes of error related to the human factor. Moreover, respondents reported errors to supervising
attending physicians in 43.5 of cases and 83.7% of them discussed about errors with colleagues. Reported involvement in medical errors was significantly more frequent for physicians working in larger hospitals and significantly less frequent for physicians practicing in a district general hospital, for those who deemed insufficient the effectiveness of risk management interventions adopted in their own practice setting, and for those practicing in medical specialties, general surgery and surgical specialties (Model 3 in Table 3).

Discussion

This study offers an insight in a nationwide sample of Italian physicians regarding knowledge, attitudes and behavior toward the prevention of medical errors, and it provides a tool for understanding opportunities to improve patient care safety. To our knowledge, this is the first attempt to investigate all of these issues in the Italian healthcare setting.

Physicians’ knowledge on evidence-based patient safety practices

To ascertain knowledge about effectiveness of interventions aimed at the reduction of clinical risk, we relied on previously validated and published questions [10, 11]. New evidence has emerged, there has been increasing awareness of the general paucity of safety and quality evidence, and limitations of traditional quantitative methods for studying this field have been pointed out [17, 18]. Nevertheless, our questionnaire addressed evidence that was current at the time of the survey and would have reflected the potential evidence base of physicians.

One of the criteria for selecting items to investigate knowledge was suitability to the Italian healthcare organization. For instance, in spite of strong evidence of effectiveness, we did not consider the item ‘Including a pharmacist on hospital rounds when physicians review patient care’, since few pharmacists are employed in Italian hospitals, and they have a marginal role in the ward rounds. We excluded the question on the importance to have only physicians with intensive care training on ICUs, since in Italy this training is mandatory to practice in ICUs. We included the AHRQ report item ‘counting surgical items during an invasive surgical procedure’ since ‘surgical objects accidentally left inside the body after surgery’ is in the list of 16 sentinel events enacted by the Italian Minister of Health [19]. About 90% of physicians rated this intervention effective, although data supporting the evidence of effectiveness for this item are mainly based on a perceived general common sense or personal expertise [20, 21]. It may be hypothesized that our findings are related to the success of the Ministry of Health recommendations on sentinel events.

The question on the number of nurses may be considered controversial. Quality of nursing care is associated with safety, but not simply to number of nurses. Seventy percent of surveyed physicians rated this intervention effective, although data supporting the evidence of effectiveness for this item are mainly based on a perceived general common sense or personal expertise [20, 21]. It may be hypothesized that our findings are related to the success of the Ministry of Health recommendations on sentinel events.

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Table 2 Physicians’ knowledge on evidence-based patient safety practices, and attitudes about reporting and disclosure of medical errors

<table>
<thead>
<tr>
<th>Knowledge</th>
<th>% Agree</th>
<th>% Uncertain</th>
<th>% Disagree</th>
</tr>
</thead>
</table>
| Limiting certain high-risk procedures to high-volume centers | 60.5
| Giving physicians more time to spend with patients | 73.9 |
| Increasing the number of nurses in hospitals | 70.2 |
| Counting surgical items during an invasive surgical procedure | 90.2 |
| Encouraging hospitals to report serious medical errors voluntarily to a state agency | 78.5 |

% Answers based on evidence available at the time of the survey.

Performing high-risk procedures in centers who report high volumes of these procedures was rated by 60% of physicians as an effective intervention. This percentage is higher than that reported by Rosen et al. [11] but similar to that...
reported by Blendon et al. [26] who argued that few physicians would really transfer a patient to high-volume centers because of perception that errors are less frequent.

In Italy, incident reporting is a widely accepted measure, but under-reporting is the norm. Although research has not yet demonstrated a clear link between reporting and improved outcomes, incident reporting favors a better understanding of errors.

We found that more experienced physicians were also more knowledgeable, and more knowledgeable physicians were also aware that failure in patient safety may be the consequence of system and organizational flaws rather than failure of individuals. This issue has not been extensively explored in other studies, but it is consistent with the result of Rosen et al. [11], and could be explained by the fact that clinical expertise is a fundamental component of evidence-based medicine.

### Table 3 Multivariable analysis of predictors of knowledge of, attitudes toward and reported occurrence of medical errors

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR</th>
<th>95% CI</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1. Outcome: knowledge of physicians about evidence-based patient safety practices</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years since graduation</td>
<td>1.26</td>
<td>1.12–1.41</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Need of their own knowledge improvement on error prevention</td>
<td>2.14</td>
<td>0.94–4.88</td>
<td>0.070</td>
</tr>
<tr>
<td>Female</td>
<td>1.33</td>
<td>0.91–1.94</td>
<td>0.143</td>
</tr>
<tr>
<td>Areas of practice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General medicine</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surgical specialties</td>
<td>0.81</td>
<td>0.56–1.16</td>
<td>0.252</td>
</tr>
<tr>
<td>Model 2. Outcome: attitudes of physicians in the management of medical error</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years since graduation</td>
<td>0.68</td>
<td>0.51–0.92</td>
<td>0.011</td>
</tr>
<tr>
<td>Age</td>
<td>1.52</td>
<td>1.06–2.19</td>
<td>0.021</td>
</tr>
<tr>
<td>Hospital size</td>
<td>1.17</td>
<td>0.97–1.41</td>
<td>0.104</td>
</tr>
<tr>
<td>Knowledge about evidence-based patient safety practices</td>
<td>0.77</td>
<td>0.56–1.07</td>
<td>0.120</td>
</tr>
<tr>
<td>Areas of practice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General medicine</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General surgery</td>
<td>1.34</td>
<td>0.74–2.41</td>
<td>0.331</td>
</tr>
<tr>
<td>Medical specialties</td>
<td>2.05</td>
<td>1.24–3.38</td>
<td>0.005</td>
</tr>
<tr>
<td>Surgical specialties</td>
<td>1.60</td>
<td>0.95–2.71</td>
<td>0.079</td>
</tr>
<tr>
<td>ICU/ED</td>
<td>2.02</td>
<td>1.18–3.64</td>
<td>0.020</td>
</tr>
<tr>
<td>Model 3. Outcome: predictors associated with the occurrence of medical errors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of hospital setting</td>
<td>0.56</td>
<td>0.38–0.83</td>
<td>0.004</td>
</tr>
<tr>
<td>Hospital size</td>
<td>1.34</td>
<td>1.07–1.68</td>
<td>0.012</td>
</tr>
<tr>
<td>Judgement of risk management interventions’ effectiveness in their own practice setting</td>
<td>0.62</td>
<td>0.42–0.92</td>
<td>0.017</td>
</tr>
<tr>
<td>Judgement on need of their own knowledge improvement on error prevention</td>
<td>2.36</td>
<td>0.87–6.42</td>
<td>0.092</td>
</tr>
<tr>
<td>Female</td>
<td>1.39</td>
<td>0.93–2.08</td>
<td>0.105</td>
</tr>
<tr>
<td>Judgement of their knowledge in error prevention</td>
<td>0.76</td>
<td>0.51–1.12</td>
<td>0.169</td>
</tr>
<tr>
<td>Having attended risk management courses</td>
<td>1.27</td>
<td>0.86–1.88</td>
<td>0.221</td>
</tr>
<tr>
<td>Type of clinical practice</td>
<td>1.29</td>
<td>0.85–1.97</td>
<td>0.234</td>
</tr>
<tr>
<td>Attitudes in management of medical error</td>
<td>0.84</td>
<td>0.60–1.19</td>
<td>0.331</td>
</tr>
<tr>
<td>Areas of practice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General medicine</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General surgery</td>
<td>0.45</td>
<td>0.23–0.87</td>
<td>0.018</td>
</tr>
<tr>
<td>Medical specialties</td>
<td>0.48</td>
<td>0.28–0.82</td>
<td>0.007</td>
</tr>
<tr>
<td>Surgical specialties</td>
<td>0.52</td>
<td>0.29–0.91</td>
<td>0.022</td>
</tr>
<tr>
<td>ICU/ED</td>
<td>0.64</td>
<td>0.33–1.22</td>
<td>0.177</td>
</tr>
</tbody>
</table>

OR, odds ratio; CI, confidence interval; ICU/ED, intensive care units/emergency departments.

*a* Reference category.

### Attitudes about reporting and disclosure of medical errors

The majority of physicians stated that they would have discussed with colleagues if a failure in clinical management had occurred and we did not find any discrepancy between the hypothetical situation and the corresponding behavior in their practice. This is an interesting result, because it highlights the preparedness of Italian physicians at least at the informal disclosure of errors.

On the contrary, we found that only 44.5% of the surveyed physicians believe that they should discuss about a
medical error with the involved patient. This proportion is lower than that reported in a previous Italian study who documented that 73% of physicians felt they should disclose errors to patients [27]. The difficulty for healthcare workers to turn the general principles of disclosure into practice is documented [28]. Kaldjian et al. [29] found that the fear of malpractice litigation could be one of the barriers, and our results are consistent with these findings. It has been reported that physicians’ disclosure practices are influenced by their culture [27], and the safety culture environment is considered the most important barrier to improving patient care safety [30].

In accordance with other studies results, physicians believe that factors that mostly contribute to medical errors are overwork, stress or fatigue [26]. Additionally, they ascribe errors to failure of health professionals to work together or communicate as a team [31, 32]. It seems therefore crucial to create opportunities for all team members to exchange information to improve patient safety.

### Physicians’ involvement in and perceived causes of medical errors

A number of studies have documented that a majority of physicians have direct personal experience of patient incidents [33–36]. Gallagher et al. [35] reported that 5% of physicians had not been involved in errors, whereas 62% had been involved in near miss, 73% in minor errors and 55% in serious errors. We did not differentiate among near miss, minor error and serious error but the finding that ~8% of physicians had never been involved in medical errors is consistent with other studies, and should be considered a realistic and reliable result, since the IOM definition of medical errors was provided a priori to the interviewed physicians.

83.7% of respondents discussed about errors with colleagues and in 43.5% of cases reported errors to supervising attending physicians. This is in accordance with Garbutt et al. [36] who found that many physicians may prefer informal error reporting mechanisms. Research suggests that physicians’ ability to cope with adverse events depends on opportunity for learning [37]. It highlights that discussing with colleagues about medical error and reporting error to supervisor are critical to the coping process. Learning process is maximized when medical errors are formally discussed and constructive feedback offered [38].

Physicians who deemed insufficient the effectiveness of risk management interventions adopted in their own practice setting were significantly more likely to have been involved in medical errors. Therefore, it seems important that healthcare organization leaders provide adequate resource and support to physicians for the prevention and management of errors [39].

### Limitations

The results of this study should be interpreted in the light of several limitations. The use of self-administered

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**Table 4** Perceived causes and physicians’ response to occurrence of medical errors

<table>
<thead>
<tr>
<th>Perceived cause of medical errors&lt;sup&gt;a&lt;/sup&gt; (n = 640)&lt;sup&gt;b&lt;/sup&gt;</th>
<th>%&lt;sup&gt;c&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Systems structure/process</strong></td>
<td></td>
</tr>
<tr>
<td>Overwork, stress, or fatigue of health professionals</td>
<td>68.8</td>
</tr>
<tr>
<td>Failure of health professionals to work together or communicate as a team</td>
<td>47.1</td>
</tr>
<tr>
<td>Poor teamwork design within the workplace</td>
<td>33.8</td>
</tr>
<tr>
<td>Poor workplace design, inadequate availability or maintenance of equipment</td>
<td>22.5</td>
</tr>
<tr>
<td>Healthcare provider goals disagreement, i.e. financial resources restriction vs. hospital care demand</td>
<td>22.5</td>
</tr>
<tr>
<td>Poor supervision of inexperienced health professionals</td>
<td>14.2</td>
</tr>
<tr>
<td><strong>Human</strong></td>
<td></td>
</tr>
<tr>
<td>Health professionals poorly skilled or experienced</td>
<td>19.1</td>
</tr>
<tr>
<td>Failure of health professionals to communicate adequately with patients</td>
<td>16.4</td>
</tr>
<tr>
<td>Errors in diagnosis and treatment</td>
<td>15.3</td>
</tr>
<tr>
<td><strong>Other negligence, recklessness, intentional rule violation</strong></td>
<td></td>
</tr>
<tr>
<td>Uncaring, negligence of health professionals</td>
<td>11.9</td>
</tr>
<tr>
<td><strong>Physicians’ response to occurrence of medical errors (n = 643)&lt;sup&gt;b&lt;/sup&gt;</strong></td>
<td></td>
</tr>
<tr>
<td>Discussed with colleagues about medical error occurred during clinical management</td>
<td>83.7</td>
</tr>
<tr>
<td>Experienced some extent of emotional involvement</td>
<td>70.0</td>
</tr>
<tr>
<td>Reported error to supervising attending physicians</td>
<td>43.5</td>
</tr>
<tr>
<td>Made changes to reduce that type of event occurring again</td>
<td>41.2</td>
</tr>
<tr>
<td>Minimized occurrence of the event</td>
<td>3.6</td>
</tr>
</tbody>
</table>

<sup>a</sup>According to JCAHO patient safety event taxonomy [16].

<sup>b</sup>Total may not always sum to n because of missing data.

<sup>c</sup>Multiple answers were possible.
questionnaires may allow respondents to over- or under-report attitude and practice. We are confident that responses were self-reported in an anonymous and confidential setting but, given the nature of surveyed topic, we may not exclude over-inflated responses. If true, we might consider an even worst scenario than that depicted by physicians. Moreover, the response rate was 58% and a non-response bias ought to be taken into account, since it was impossible to explore characteristics of non-responders. However, it is considered that the average response rate is 61% for mailed physicians’ surveys and 52% for large sample surveys [40] and, hence, the slightly high response rate we have obtained does not allow us to suppose that non-responders were significantly different from responders.

Supplementary material

Supplementary material is available at INTQHC Journal online.

Conclusions

In Italy, patient safety culture among hospital physicians has not been extensively studied and our results add information about physicians’ knowledge, attitudes and behavior that represent one important step to understand the perceived patient safety climate before implementing initiatives in healthcare organizations. In particular, it is really impressive that so many of the surveyed physicians believe that reporting is an effective measure, and since this is strongly recommended by the Ministry of Health, it may be the consequence of the appeal government institutions or local quality experts providing continuing education courses have on physicians. The results from our study highlight that greater efforts are needed to facilitate the translation of particularly positive attitudes into appropriate practices that have proved to be effective in reducing medical errors.

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