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Original Article / Özgün Araştırma

# Critical Incident Reporting System in Teaching Hospitals in Turkey: A Survey Study

## Türkiye'deki Eğitim Hastanelerinde Kritik Olay Bildirim Sistemi: Anket Çalışması

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Abstract / Öz

**Objective:** Critical incident reporting systems (CIRS) and morbidity–mortality meetings (MMMs) offer the advantages of identifying potential risks in patients. They are key tools in improving patient safety in healthcare systems by modifying the attitudes of clinicians, nurses and staff (human error) and also the system (human and/or technical error) according to the analysis and the results of incidents.

**Methods:** One anaesthetist assigned to an administrative and/or teaching position from all university hospitals (UHs) and training and research hospitals (TRHs) of Turkey (n=114) was contacted. In this survey study, we analysed the facilities of anaesthetists in Turkish UHs and TRHs with respect to CIRS and MMMs and also the anaesthetists' knowledge, experience and attitudes regarding CIs.

**Results:** Anaesthetists from 81 of 114 teaching hospitals replied to our survey. Although 96.3% of anaesthetists indicated CI reporting as a necessity, only 37% of departments/hospitals were reported to have CIRS. True definition of CI as "an unexpected /accidental event" was achieved by 23.3% of anaesthetists with CIRS. MMMs were reported in 60.5% of hospitals. Nevertheless, 96% of anaesthetists believe that CIRS and MMMs decrease the incidence of CI occurring. CI occurrence was attributed to human error as 4 [1–5]/10 and 3 [1–5]/10 in UHs and TRHs, respectively (p=0.005). In both hospital types, technical errors were evaluated as 3 [1–5]/10 (p=0.498).

**Conclusion:** This first study regarding CIRS in the Turkish anaesthesia departments/hospitals highlights the lack of CI knowledge and CIRS awareness and use in anaesthesia departments/teaching hospitals in Turkey despite a safety reporting system set up by the Turkish Ministry of Health.

**Keywords:** Critical incident, critical incident reporting systems, morbidity–mortality meetings, patient safety, anaesthesia

**Amaç:** Kritik olay (KO) bildirim sistemi (KOBS) ve morbidite-mortalite toplantıları (MMT) hastalarda ortaya çıkabilecek riskleri belirleme avantajı sunar. Bunlar; kritik olayların analiz ve sonuçlarına göre klinisyen, hemşire, personel (insan hataları) davranışlarının ve hatta sistemin (insan ve/veya teknik hatalar) değiştirilmesiyle sağlık-bakım sisteminde hasta güvenliğini iyileştirilmede anahtar rol oynarlar.

**Yöntemler:** Türkiye'deki tüm Üniversite (ÜH) ile Eğitim ve Araştırma Hastanelerinden (EAH) (n=114) seçilen uzman ve/veya daha kıdemli pozisyondaki bir anestezist ile irtibat kuruldu. Bu çalışmada ÜH ile EAH'de çalışan anestezistlerin KOBS ve MMT açısından imkanları ile aynı zamanda KO'lar hakkındaki bilgileri, deneyimleri ve davranışları tarafımızca araştırıldı.

**Bulgular:** Yüz on dört eğitim hastanesinden 81 anestezist anketimizi yanıtladı. Anestezistlerin %96,3'ü KO bildirimini bir gereklilik olarak görmesine rağmen, sadece %37 bilim dalının/hastanenin KOBS'sinin olduğu belirtildi. KOBS'si olan anestezistlerin yalnız %23,3'ü KO'yu 'beklenmeyen/istenmeyen olay' şeklinde doğru tanımladı. Hastanelerin %60,5'inde MMT olduğu bildirildi. Bunlarla birlikte, anestezistlerin %96'sı KOBS ve MMT'nin KO ile karşılaşma sıklığını düşürdüğüne inandığını açıkladı. KO gelişimi ÜH'de ve EAH'de sırasıyla 4 [1-5]/10 ve 3 [1-5]/10 olarak insan hatasına bağlandı (p=0,005). Her iki hastane modelinde de teknik hatalar 3 [1-5]/10 olarak değerlendirildi (p=0,498).

**Sonuç:** Türkiye Anestezi bilim dallarındaki/hastanelerindeki KOBS ile ilgili olarak yapılan bu ilk çalışma; TC Sağlık Bakanlığı tarafından hazırlanan bir güvenlik raporlama sistemi olmasına rağmen, KO bilgisinin, KOBS farkındalığının ve Anestezi bilim dalları/eğitim hastanelerindeki sistem kullanımının yetersizliğini göstermektedir.

**Anahtar kelimeler:** Kritik olay, kritik olay bildirim sistemleri, morbidite-mortalite toplantıları, hasta güvenliği, anestezi

## Introduction

A critical incident (CI) is defined as 'an event or circumstance that could have resulted, or did result, in an unnecessary harm to a patient' (1). The advantages of CI reporting systems (CIRS) and/or morbidity–mortality meetings (MMMs) are learning from individual cases, modifying the attitudes of the clinicians, nurses and staff and preventing the negative outcomes of future CIs by system change (2-4).

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The necessity of CIRS in anaesthesia is highlighted in terms of lowering the incidence of CIs and improving the patient safety (3, 5, 6). The frequency of voluntarily reported incidents from individual hospitals remains low (7-10). The probable reasons for the low reporting rate include the lack of CIRS, fear of punitive/blame action, poor safety for the patient and clinician, lack of training/understanding among clinicians regarding what should be reported and lack of awareness concerning how the reported incidents will be analysed and shared and lead to clinical practice changes (3).

Patient safety culture should be taught to anaesthesia trainees via a working example (11-13). In Turkey, anaesthesia training is given in either university hospitals (UHs) or training and research hospitals (TRHs). UHs are capable of providing opportunities and possibilities to train medical faculty students, interns, residents, fellows and other medical personnel. As UHs have well-regulated preclinical, internal and surgical departments, the trainees could easily be subjected to a comprehensive education and practice. In contrast, TRHs mostly do not have medical students and preclinical departments and provide education to residents and fellows. Although safety is a major part of the education system everywhere, the management of CIRS and MMMs systems may differ.

Although a recently published European review reported only six European countries with nationally organized CIRS (5), Turkey has had a national system for patient safety since 2012. However, anonymous non-punitive action and the related Turkish laws remain conflictive. The primary aim of this survey study was to investigate the knowledge of anaesthetists in terms of CIs and CIRS, while the secondary aims were to survey the current facilities, including the use of CIRS and MMMs, of different anaesthesia departments of UHs and TRHs in Turkey and also the attitudes/experiences of anaesthetists.

## Methods

We contacted one anaesthetist assigned to an administrative and/or teaching position from all UHs and TRHs in Turkey (n=114) between October 2014 and March 2015. A survey was sent to gather information regarding their knowledge, professional experience and also the departmental facilities in terms of CIs, CIRS and MMMs. If a specific anaesthetist did not reply to the survey after three inquiries, it was sent to another anaesthetist in the same hospital with a similar position. The survey was accepted as "not replied" if the second anaesthetist did not reply, despite further three attempts. There was no provision for identifying the anaesthetist and the affiliated centre.

The survey was based on previous published studies (3, 6, 11, 12, 14-16) and was pilot tested on eight anaesthetists from our department to avoid misleading, inappropriate or redundant questions. Furthermore, the survey was checked for its compliance with the Helsinki Declaration. The survey comprised 27 questions (Appendix 1). Anaesthetists were questioned for

1. The presence and their conviction of the necessity for CIRS and/or MMMs in their departments/hospitals (Questions 2–4),
2. CI definition and the use of CIRS (Questions 5–13),
3. MMMs and their role in daily clinical practice (Questions 14–16) and
4. Human and/or technical factors leading to CIs, the population and timing of these incidents and team sharing related to these events (Questions 17–27).

A multiple choice and/or tick box methods were used for the CI survey for ease of data entry. Anaesthetists were asked to rate the frequency and causes of met CIs with either an 11-point scale (0, no effect and 10, most effective) (Questions 17, 24, 25), (0, no effect and 10, most frequent) (Questions 26, 27) or a 5-point scale (0, never and 4, very frequently) (Questions 21, 22).

**Statistical analysis**

Data are given as a median [minimum–maximum] and number (%). Categorical data and non-parametric data were analysed using the chi-square and Mann–Whitney U test, respectively. Statistically significance was set as a p value of <0.05.

## Results

**1) Presence of CIRS and/or MMMs in teaching hospitals**

Eighty-one anaesthetists from 114 different teaching hospitals in Turkey replied to our survey on behalf of their centres. Forty-six of the 81 anaesthetists (56.8%) were from UHs and 35 were from TRHs (43.2%). The results regarding the presence of CIRS and/or MMMs in their anaesthesia departments/hospitals and their belief for the necessity of CI reporting are given in Figure 1 and Table 1.

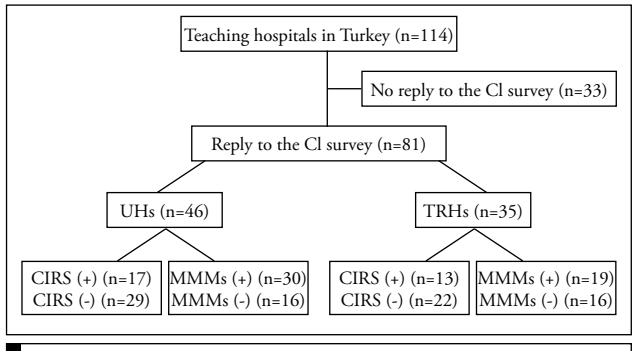


Figure 1. Diagram of the Anaesthesia Critical Incident Survey for Teaching Hospitals of Turkey

CI: critical incident; UHs: university hospitals; TRHs: training and research hospitals; CIRS: critical incident reporting systems; MMMs: morbidity-mortality meetings

Table 1. Questions to all anaesthetists who replied to our Anaesthesia CI survey (n=81)

| | | UHs (n=46) | TRHs (n=35) | Total (n=81) | p |
|---|---|---|---|---|---|
| Presence of CIRS in the department/hospital | Yes | 17/46 (37%) | 13/35 (37%) | 30/81 (37%) | 0.986 |
| | No | 29/46 (%63) | 22/35 (63%) | 51/81 (63%) | |
| Presence of MMMs in the department/hospital | Yes | 30/46 (65.2%) | 19/35 (54.3%) | 49/81 (60.5%) | 0.0047 |
| | No | 16/46 (34.8%) | 16/35 (45.7%) | 32/81 (39.5%) | |
| Necessity of CI reporting | Yes | 45/78 (55.6%) | 33/78 (40.7%) | 78/81 (96.3%) | 0.575 |
| | No idea | 1/3 (1.2%) | 2/3 (2.5%) | 3/81 (3.7%) | |
| | No | 0/0 (0%) | 0/0 (0%) | 0/81 (0%) | |

CI: critical incident; UHs: university hospitals; TRHs: training and research hospitals; CIRS: critical incident reporting systems; MMMs: morbidity-mortality meetings

Table 2. Questions to anaesthetists who have CIRS in their department/hospital (n=30)

| | | UHs (n=17) | TRHs (n=13) | Total (n=30) | p |
|---|---|---|---|---|---|
| True definition of CI as unexpected/accidental events | Yes | 6/7 (20%) | 1/7 (3.3%) | 7/30 (23.3%) | 0.103 |
| | No | 11/23 (36.7%) | 12/23 (40%) | 23/30 (76.7%) | |
| Knowledge of CI reporting as an extraordinary event/deficiency 'without identifying the related individual' | Yes | 14/27 (46.6%) | 13/27 (43.4%) | 27/30 (90%) | 0.24 |
| | No | 3/3 (10%) | 0/3 (0%) | 3/30 (10%) | |
| Knowledge of CI reporting has no law enforcement | Yes | 11/20 (36.7%) | 9/20 (30%) | 20/30 (66.7%) | 1 |
| | No | 6/10 (20%) | 4/10 (13.3%) | 10/30 (33.3%) | |
| CI reporting increases patient safety | Yes | 12/21 (40%) | 9/21 (30%) | 21/30 (70%) | 0.822 |
| | Partially | 4/8 (13.3%) | 4/8 (13.3%) | 8/30 (26.6%) | |
| | No | 1/1 (3.4%) | 0/1 (0%) | 1/30 (3.4%) | |
| Anaesthetists that have reported a CI | Yes | 10/17 (33.4%) | 7/17 (23.3%) | 17/30 (56.7%) | 1 |
| | No | 7/13 (23.3%) | 6/13 (20%) | 13/30 (43.3%) | |
| Training for CIRS | Yes | 9/13 (30%) | 4/13 (13.3%) | 13/30 (43.3%) | 0.2828 |
| | No | 8/17 (26.7%) | 9/17 (30%) | 17/30 (56.7%) | |
| Appropriate/sufficient CI reporting forms | Yes | 14/24 (46.7%) | 10/24 (33.3%) | 24/30 (80%) | 1 |
| | No | 3/6 (10%) | 3/6 (10%) | 6/30 (20%) | |

CIRS: critical incident reporting systems; UHs: university hospitals; TRHs: training and research hospitals; CI: critical incident

**2) CI and CIRS**

Only 30 of 81 anaesthetists reported having CIRS in their anaesthesia departments/hospitals (Table 1). These anaesthetists were asked to define CI and CIRS (Table 2). Anaesthetists familiar with CIRS reported that they learned it mostly either during a convention/course/education seminar (31.8%) or from a journal/article/internet (30.2%). They were further questioned whether they believed in the improvement of patient safety by reporting, if they had any experience in reporting, if they were trained regarding this system and if the systems they had were appropriate/sufficient (Table 2).

Only nine of 81 anaesthetists who had not reported CI before declared their reasons as the forms being long (26.7%), finding CI reporting unnecessary (26.7%), time insufficiency (20%), deficiency of patient follow-up (20%) or not having CIRS in their departments (6.6%).

**3) MMMs**

Forty-nine of 81 anaesthetists reported having MMMs in their anaesthesia departments/hospitals (Table 1). Table 3 demonstrates the conviction of anaesthetists regarding the usefulness and effectiveness of MMMs in their practice.

Overall, 24 of 49 (49%) totally [13/24 (26.5%) from UHs and 11/24 (22.5%) from TRHs] and 23 of 49 (47%) partially [16/23 (32.7%) from UHs and 7/23 (14.3%) from TRHs] believed that CIRS and MMMs decrease the incidence of possible prospective CIs (p=0.526).

Table 3. Questions to anaesthetists who have MMMs in their department/hospital (n=49)

| | | UHs (n=30) | TRHs (n=19) | Total (n=49) | p |
|---|---|---|---|---|---|
| MMMs help to understand when the problem has occurred | Yes | 17/23 (34.7%) | 6/23 (12.2%) | 23/49 (46.9%) | 0.147 |
| | Partially | 13/26 (26.5%) | 13/26 (26.5%) | 26/49 (53.1%) | |
| | No | 0 (0%) | 0 (0%) | 0/49 (0%) | |
| MMMs lead to the changes in daily practice | Yes | 14/19 (28.6%) | 5/19 (10.2%) | 19/49 (38.8%) | 0.195 |
| | Partially | 16/29 (32.7%) | 13/29 (26.5%) | 29/49 (59.2%) | |
| | No | 0/1 (0%) | 1/1 (2%) | 1/49 (2%) | |

MMMs: morbidity-mortality meetings; UHs: university hospitals; TRHs: training and research hospitals

**4) Anaesthetists' convictions concerning human and/or technical errors**

Seventy-five of 81 anaesthetists contributed to these questions regarding their observations, experiences and daily clinical practices (43 from UHs and 32 from TRHs). They rated CI occurrence because of human errors in UHs and TRHs as 4 [1-5] and 3 [1-5], respectively, out of 10 points (p=0.005). In both hospital types, technical errors were rated as 3 [1-5]/10 (p=0.498). Anaesthetists mostly blamed surgeons (21%), anaesthesia technicians (19.7%) and themselves (17.7%) for human errors.

According to the anaesthetists, CIs generally occurred because of a chain of problems [total, 58/75 (77.3%); 32/58 from UHs and 26/58 from TRHs) (p=0.582). It was reported that 24% (18/75; 12 from UHs and 6 from TRHs) of anaesthetists definitely and 68% (51/75; 27 from UHs and 24 from TRHs) of anaesthetists partially share CIs with their colleagues and teammates to make changes in their practice (p=0.533).

Hypothermia, airway/pulmonary problems and haemodynamic instability because of anaesthesia were rated as the most frequently encountered three CIs; fatigue, insufficiency of personnel/workforce and inexperience were declared as the most common reported reasons for CI occurrence. Moreover, the vast majority of the anaesthetists (90.7%) believe that CI occurrence affect the duration of post-operative care unit (PACU) and hospital and intensive care unit (ICU) stay. The human factors of anaesthetists reported to be the most common contributors to CI occurrence were numerous on-calls/sleeplessness, long working hours/heavy workload, training and experience of anaesthetists.

Elderly patients with high American Society of Anesthesiologists (ASA) physical status scores, patients undergoing cardiac-, neuro- or urgent-surgeries, patients undergoing general anaesthesia (GA) and complex surgical procedures were reported to have a higher risk of CI occurrence. In addition, CI risks were declared to increase early in the mornings and at nights. During whole anaesthesia procedures, induction (intubation) and post-operative/post-anaesthesia (extubation) periods were assessed as the most hazardous.

On the other hand, 28 of the 75 anaesthetists who shared their observations and experiences with us were from the Anaesthesia CIRS (+) departments. When their clinical experience-related answers were compared to the rest of the anaesthetists from the CIRS (–) departments (47/75), only the factors related to anaesthesia were statistically significant, and the anaesthetists with CIRS reported less anaesthesia-related haemodynamic instabilities [CIRS (+), 3 [1-4]; CIRS (–), 3 [1-5]; p=0.044], fewer GA complications [CIRS (+), 2 [1-4]; CIRS (–), 3 [1-4]; p=0.003] and less airway problems/difficult airways [CIRS (+), 2 [2-4]; CIRS (–), 3 [1-4]; p=0.035].

## Discussion

This survey clearly shows the wide lack of CIRS training systems, but without any difference between the Anaesthesia departments of UHs and TRHs. Although, CI knowledge, awareness and the use of written formal CIRS are all similarly deficient, structured MMMs are used more frequently in UHs compared to in TRHs. Anaesthetists in many Turkish teaching hospitals believe in necessity; however, they mostly just report an informal discussion of CIs and their causes with their respective teams.

Interestingly, CIRS exists in a total of 37% of teaching hospitals in Turkey as individual systems. However, only a low number of anaesthetists in CIRS (+) departments were able to truly define a CI and only 56.7% of them reported using the system. These findings may be explained by inadequate training, as demonstrated by the fact that only 43.3% of anaesthetists had formal training to use the system. Of note, although anaesthetists from CIRS (+) departments mostly evaluated their forms as appropriate/sufficient, 11.1% of all the anaesthetists who declared not reporting a CI before explained their reasons mostly as due to the long forms, time insufficiency and finding CI reporting unnecessary. A lack of belief that reporting will have a beneficial result may indeed also be one reason for the low reporting, as demonstrated in previous studies (17-21). To be successful, the clinician must have faith that their report will be assessed and steps will be taken to prevent similar incidents occurring (3). In our survey, 70% of anaesthetists in CIRS (+) departments definitely

and 26.6% partially believed in the patient safety effect of the reporting system.

Critical incident reporting systems for anaesthesia can be developed either in descending (top-down) (governmentally funded national organizations reaching to local hospitals) or ascending (bottom-up) order. For an optimally functioning system, both national co-ordination and specialist champions are necessary. However, although a nationally conceived CIRS that promises a non-punitive system and root cause analysis has been formed by the Turkish Ministry of Health in 2012, there is yet no real improvement or routine use in most of departments/hospitals. One reason could be an insufficient announcement and explanation of the safety reporting system.

Another reason may be the fear/expectation in healthcare personal that any reported incident would cause a backlash disciplinary or legal prosecution by the employer or affected patient (17, 22). Whether incident data are disclosable in potential prosecutions, may also play a role in the low reporting according to the perception of national laws about CIRS. Turkish laws obligate any person witnessing and/or contributing to a CI to report their related administrations with no anonymity.

According to our survey, 90% of anaesthetists from CIRS (+) teaching hospitals declared that they know CIRS is irrelevant in terms of indicating the related individual, and only 66.7% reported that this system has no law enforcement. CIRS solution to this problem in the United Kingdom, Switzerland and Denmark is to make reports anonymous so that individual clinicians cannot be identified. There is no legal provision to protect reporting people/hospitals in Spain and Switzerland; however, Denmark and Germany have laws encouraging but protecting the reporting people/system (5).

Furthermore, as explained above, there is as yet not enough connection between the specialty-focused initiatives and hospital systems to establish either an ascending or a descending model. Therefore, unless a specifically structured system to obtain the maximum amount of details while maintaining patient, physician, observer and reporter privacy without punitive action is provided, like in some European countries (5), such an effort may be unsustainable.

Although the number is still low, MMMs seem to be more common in Turkey (60.5%). What is more to the point is that 98% of the anaesthetists from MMMs (+) departments/hospitals report partial or total changes in their daily clinical practices from taking the assessments and results into consideration. Although there has been no formal written system, departmental MMMs or alternative multidisciplinary meetings may be the starting points for now. These systems may be deficient, however, in terms of the easy identification of the responsible people and them not being able to include near-misses. In our opinion, the most pleasing result of this survey is that anaesthetists are open to improvements and 92% of them make an effort to change their basic attitudes and clinical practices (24% definitely and 68% partially) following informal discussions with their colleagues and teammates.

Because there is no dedicated nationwide anaesthesia CIRS cascade, we carried out our survey by questioning our anaesthetists' expertise on CIs. They believe that elderly patients with high ASA scores, patients undergoing cardiac-, neuro- or urgent-surgeries and patients undergoing GA and complex surgical procedures have a higher risk for CI occurrence. In addition, CI risks were declared to increase early in the mornings and at nights. Induction (intubation) and post-operative/post-anaesthesia (extubation) periods were assessed as the most hazardous times. Maaløe et al. (14) reported a relationship between the increased CI risk and old age, high ASA scores, urgency, abdominal surgery and a regional-general anaesthesia combination. Previous studies give conflicting results with various ASA scores, and mostly report induction and maintenance periods as risky for CI occurrence (6, 9, 14, 23). Moreover, the vast majority of our anaesthetists (90.7%) think that the CI occurrence effects the duration of PACU and hospital and ICU stay. However, Staender et al. (6) reported that most of the incidents (72%) had no role on the patients' outcome, and the morbidity of different severities, including unplanned ICU admission or prolonged hospital stay, was reported as only 21%. This contradiction with our results may be due to a recall bias. Indeed, a significantly altered memory of events with longer times from what actually occurred may always be possible in retrospective survey studies (24).

In two previous studies, human errors were reported as the cause in 42% and 41% of the CI cases (6, 9). Similarly, anaesthetists in our survey rated human error as the most frequent cause. One must remember that 'to err is human' (25), as there is simply no perfect person or physician that never makes any mistakes. This imperfection, i.e. the human factor, is the weakest link and may cause serious mortality. Human errors were believed to be a factor in 65% of 52 deaths and 83% of 589 deaths in different studies (26, 27). In an earlier study, 7.5% of the reported deaths were attributed to 'gross anaesthetic mismanagement' (28). Luckily, these human errors are also the most preventable (82%) (16).

Harmful events usually occur when not only one, but more protecting barriers are broached (29, 30). In our survey, 77.3% of anaesthetists who replied these questions believe that CIs generally occur due to a chain of problems rather than due to a single mishap. CIRS again gains importance here to understand at what level the problems start and occur, and thus, can help to correct the whole system.

Hypothermia, airway/pulmonary problems and haemodynamic instability due to anaesthesia were rated as the three most experienced CIs. However, anaesthetists from CIRS (+) departments reported significantly less anaesthesia-relat-

ed haemodynamic instability, GA complications and airway problems/difficult airways. It may be that these centres corrected their equipment deficiency following root cause analysis. Fatigue, insufficiency of personnel/workforce and inexperience were declared as the most common reported reasons for CI occurrence in our survey.

In this study, our main limitation was that there was no hard data in terms of CIs and that all consequences reflect the anaesthetists' convictions, observations and experiences. These observations may be affected by recall bias as explained above. Our second limitation is that the study target population was teaching hospitals, which thus excludes other government or private hospitals in Turkey.

We believe that this survey study is very important as there has been no previously published data on CIs, CIRS and MMMs in Turkey. This is the first useful mirror that shows the actual condition of the patient safety and reporting systems in Anaesthesia departments/hospitals, and also the process of a nationalized system. In our view, this will shed light on the future establishments of CIRS and improvements. Moreover, since this present study flaunts the discrepancy between the safety reporting system's anonymous non-punitive action and the deficiency of Turkish laws at this point, it could lead to the law-makers considering new necessary arrangements.

## Conclusion

There is still much to be done in the field of anaesthesia in conjunction with the Turkish Ministry of Health. A system should be designed and implemented to raise the awareness of anaesthetists and to provide CIRS training, in order to decrease or even to prevent CIs and the related morbidities and mortalities. As the reporting system is set up, future studies will be required either for the promotion, assessment and supervision of CIRS itself or for the correction of human and technical errors with respect to the data obtained from CIRS in Turkey.

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**Ethics Committee Approval:** Authors declared that the research was conducted according to the principles of the World Medical Association Declaration of Helsinki "Ethical Principles for Medical Research Involving Human Subjects", (amended in October 2013).

**Informed Consent:** There was no need to obtain a patient informed consent because of not performing a study on patients.

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Appendix 1. Anaesthesia critical incident (CI) survey for teaching hospitals of Turkey

1. Which type of teaching hospital do you work in Turkey?
   a. University Hospitals (UHs)
   b. Training and Research Hospitals (TRHs)
2. Do you have CI reporting systems (CIRS) in your department/hospital?
   a. Yes
   b. No
3. Do you organize morbidity–mortality meetings (MMMs) in your department/hospital?
   a. Yes
   b. No
4. Do you think CI reporting is necessary?
   a. Necessary
   b. Not necessary
   c. No idea
5. What is CI? It includes which of the followings? (multiple choice can be marked)
   a. ≥1 adverse effect(s)/complication(s)
   b. Unexpected/accidental events
   c. Patient or personnel injury and/or equipment damage
6. How did you become aware of the necessity of CI reporting? (multiple choice can be marked)
   a. Other colleagues
   b. Convention/course/education seminars
   c. Routine daily practice of your department
   d. Journal/article/internet
7. Do you know that the aim of CI reporting is to share the extraordinary event/deficiency 'without indicating the related individual'?
   a. Yes
   b. No
8. Do you know that CI reporting has no law enforcement?
   a. Yes
   b. No
9. Do you think CI reporting increases the patient safety?
   a. Yes
   b. Partially
   c. No
10. Have you ever reported CI?
    a. Yes
    b. No
11. Have you ever received any training in order to use CIRS?
    a. Yes
    b. No
12. Do you think CI reporting forms in your department are appropriate/sufficient enough to meet your necessities?
    a. Yes
    b. No
13. If your reply is 'no' to the previous question: Why? (multiple choice can be marked)
    a. Long forms
    b. Time insufficiency
    c. Finding CI reporting unnecessary
    d. Patient follow-up deficiency
    e. No CIRS at your department
    f. Others

Appendix 1. Anaesthesia critical incident (CI) survey for teaching hospitals of Turkey (continued)

14. Do the outcomes of MMMs help you to understand that when the problem has occurred?
    a. Yes
    b. Partially
    c. No

15. Do the outcomes of these MMMs lead to the changes in your daily practice?
    a. Yes
    b. Partially
    c. No

16. Do you think these CIRS and MMMs decrease the incidence of meeting a CI?
    a. Yes
    b. Partially
    c. No

17. Score the frequency of following factors to cause a CI. (0: no effect, 10: most effective)

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Human errors | | | | | | | | | | | |
| Technical errors | | | | | | | | | | | |

18. Usually, who are the responsible people of CI occurrence in operating rooms? (multiple choice can be marked)
    a. Patient
    b. Anaesthetists
    c. Anaesthesia technician
    d. Surgeon
    e. Surgery nurse
    f. Personnel

19. Usually, which one is the reason of a CI occurrence?
    a. one problem
    b. chain of problems

20. Do you share problems and reasons of CIs with the other clinicians/surgeons/nurses/staff (teammates) to make changes?
    a. Yes
    b. Partially
    c. No

21. Score the frequency of the met CIs. (0, never; 4, very frequently)

| | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Injection from wrong cannula or catheter | | | | | |
| High dose drug injection | | | | | |
| Low/insufficient dose drug injection | | | | | |
| Erroneous labelling of the drug syringes | | | | | |
| Airway/pulmonary problems | | | | | |
| Difficult intubation/failure | | | | | |
| Ventilation problems | | | | | |
| Mechanical ventilator/circuit abruption | | | | | |
| Mechanical ventilator gas flow changes | | | | | |
| Re-intubation after extubation | | | | | |
| Awareness | | | | | |
| Emergence problems/residual neuromuscular blocker effect | | | | | |
| Haemodynamic instability due to anaesthesia | | | | | |
| Hypovolemia (insufficient fluid replacement) | | | | | |
| Hypervolemia (excessive fluid replacement) | | | | | |

Appendix 1. Anaesthesia critical incident (CI) survey for teaching hospitals of Turkey (continued)

Hypothermia
Acidosis
Massive haemorrhage
Neurologic injury due to position
Fall from stretcher
Wrong side surgery
Aspiration
Complications due to general anaesthesia (GA)
Deep venous thrombosis/Pulmonary thromboembolism
Malignant hyperthermia
Complications due to regional anaesthesia
Methemoglobinaemia
Local anaesthetic (LA) toxicity
Allergic reactions
Anaphylaxis
Insufficient analgesia
Insufficient/inappropriate resuscitation
Needle injury to operating room personnel
Complications due to general anaesthesia (GA)

22. Score the likelihood of the following factors to cause a CI. (0, never; 4, very frequently)

| | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Turning monitor alarm sounds down | | | | | |
| Errors in drug preparation and labelling | | | | | |
| Errors and deficiencies in using mechanical ventilator | | | | | |
| Leakage of ventilator system | | | | | |
| Airway problems/difficult airway | | | | | |
| Insufficient preparation for difficult airway | | | | | |
| Early extubation | | | | | |
| Inappropriate patient transfer | | | | | |
| Inappropriate disposition of needle-sticks and/or sharps | | | | | |
| Insufficient set up | | | | | |
| Insufficient monitoring/monitor problems/deficiencies | | | | | |
| Errors in fluid management | | | | | |
| Malfunction of infusion pumps | | | | | |
| Inadequate transfer of patient information | | | | | |
| Non-routine practices | | | | | |
| Insufficient pre-operative assessment | | | | | |
| Reading or understanding pre-operative assessment wrongly | | | | | |
| Insufficient management of patient's previous illnesses | | | | | |
| Technical impossibility (deficiency or inappropriateness of device, needle, catheter, monitor, ventilator, infusion pump…) | | | | | |
| Insufficiency of personnel/workforce | | | | | |
| Not asking for help when needed | | | | | |
| Carelessness | | | | | |
| Fatigue | | | | | |
| Inexperience | | | | | |
| Insufficient supervision of experienced clinicians | | | | | |

Appendix 1. Anaesthesia critical incident (CI) survey for teaching hospitals of Turkey (continued)

23. Do the CIs affect the post-operative care unit (PACU), hospital and intensive care unit (ICU) stay duration?
    a. Effects
    b. Does not effect
    c. No idea

24. Score the following human and system factors to cause a CI. (0, no effect; 10, most effective)

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Training and experience of personnel | | | | | | | | | | | |
| Training and experience of surgeons | | | | | | | | | | | |
| Training and experience of anaesthetists | | | | | | | | | | | |
| Long working hours/heavy workload | | | | | | | | | | | |
| Numerous on-calls/sleeplessness | | | | | | | | | | | |
| Excessive number of patients per day | | | | | | | | | | | |
| Stressful work environment | | | | | | | | | | | |
| Financial dissatisfaction | | | | | | | | | | | |
| Social relationships and communication with patients | | | | | | | | | | | |
| Clinicians' social relationships and communication with each other | | | | | | | | | | | |

25. Score the following patient factors to cause a CI. (0, no effect; 10, most effective)

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Low ASA scores (I-II) | | | | | | | | | | | |
| High ASA scores (III-IV) | | | | | | | | | | | |
| Young ages | | | | | | | | | | | |
| Elderly | | | | | | | | | | | |
| Patients with abdominal surgeries | | | | | | | | | | | |
| Patients with cardiac surgeries | | | | | | | | | | | |
| Patients with extremity surgeries | | | | | | | | | | | |
| Neurosurgery patients | | | | | | | | | | | |
| Elective cases | | | | | | | | | | | |
| Urgent cases | | | | | | | | | | | |
| Patients who need complex anaesthesia procedures | | | | | | | | | | | |
| Patients who need complex surgical procedures | | | | | | | | | | | |
| Patients undergoing general anaesthesia (GA) | | | | | | | | | | | |
| Patients undergoing regional anaesthesia (RA) | | | | | | | | | | | |

26. Score the frequency of CI occurrence time. (0, no effect; 10, most frequent)

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| In the morning | | | | | | | | | | | |
| At noon | | | | | | | | | | | |
| In the afternoon | | | | | | | | | | | |
| In the evening | | | | | | | | | | | |
| At night | | | | | | | | | | | |
| Early in the morning | | | | | | | | | | | |

Appendix 1. Anaesthesia critical incident (CI) survey for teaching hospitals of Turkey (continued)

27. Score the frequency of CI occurrence during course of anaesthesia. (0, no effect; 10, most frequent)

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Pre-anaesthesia/Pre-operative | | | | | | | | | | | |
| Pre-medication | | | | | | | | | | | |
| Induction (Intubation) | | | | | | | | | | | |
| During maintenance of anaesthesia/surgery | | | | | | | | | | | |
| Post-operative/Post-anaesthesia (Extubation) | | | | | | | | | | | |
| PACU (Post-anaesthesia care unit) | | | | | | | | | | | |