

Trauma research in Qatar: a literature review and discussion of progress after establishment of a trauma research centre

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الأبحاث المتعلقة بالصدمات في قطر: مراجعة للأدبيات ومناقشة التقدم المحرز بعد إنشاء مركز أبحاث الصدمات
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الخلاصة: إن وجود برنامج بحثي منظم يُعتبر أحد الركائز الأساسية لنظام العناية بالصدمات. وعلى الرغم من ارتفاع معدل الوفيات المرتبطة بالإصابات - لاسيما الحوادث المرورية - في قطر فإن البحوث المتعلقة بالصدمات لم تُعطَ إلا القليل من الأهمية. وقد هدفت هذه المراجعة إلى تحليل منشورات بحثية عن موضوع الصدمات نشرت من قطر، وإلى مناقشة تقدم البحث السريري في دولة قطر وفي بلدان مجلس التعاون الخليجي، مع التركيز - بشكل خاص - على البحوث المتعلقة بالصدمات. فمن خلال البحث في الأدبيات باستخدام محركي البحث PubMed والباحث العلمي في جوجل Google Scholar تم العثور على 757 مقالة باللغة الإنجليزية في مجالات الطب الباطني والجراحة والصدمات صادرة من قطر بين عامي 1993 و 2013. ويمكن ربط الزيادة الحادة في عدد المنشورات المتعلقة بالصدمات منذ عام 2010 بإنشاء مركز أبحاث الصدمات في قطر في عام 2011. إننا نعتقد أن إنشاء وحدة للبحوث كان له تأثير كبير على الإنتاجية البحثية، والتي تعود بالفائدة - في نهاية المطاف - على الرعاية الصحية.

ABSTRACT A structured research programme is one of the main pillars of a trauma care system. Despite the high rate of injury-related mortalities, especially road traffic accidents, in Qatar, little consideration has been given to research in trauma. This review aimed to analyse research publications on the subject of trauma published from Qatar and to discuss the progress of clinical research in Qatar and the Gulf Cooperation Council countries with special emphasis on trauma research. A literature search using *PubMed* and *Google Scholar* search engines located 757 English-language articles within the fields of internal medicine, surgery and trauma originating from Qatar between the years 1993 and 2013. A steep increase in the number of trauma publications since 2010 could be linked to the setting up of a trauma research centre in Qatar in 2011. We believe that establishing a research unit has made a major impact on research productivity, which ultimately benefits health care.

Recherche sur les traumatismes au Qatar : analyse de la littérature et discussion sur les progrès après l'établissement d'un centre de recherche sur les traumatismes

RÉSUMÉ Un programme de recherche structuré représente l'un des piliers principaux d'un système de soins des traumatismes. En dépit du fort taux de mortalité lié aux traumatismes, notamment consécutif à un accident de la route au Qatar, peu d'attention a été accordé à la recherche sur les traumatismes. La présente analyse visait à étudier les travaux de recherche sur le sujet des traumatismes publiés au Qatar et à discuter des progrès de la recherche clinique au Qatar et dans les pays membres du Conseil de coopération du Golfe en mettant l'accent sur la recherche en la matière. Une recherche de la littérature à l'aide des moteurs de recherche *PubMed* et *Google Scholar* a permis d'identifier 757 articles en langue anglaise dans les domaines de la médecine interne, de la chirurgie et des traumatismes, provenant du Qatar entre 1993 et 2013. La forte augmentation du nombre de publications sur les traumatismes depuis 2010 peut être liée à l'établissement d'un centre de recherche sur les traumatismes au Qatar en 2011. Nous pensons que l'établissement d'une unité de recherche a eu un impact important sur la productivité de la recherche, ce qui à la longue est bénéfique pour les soins de santé.

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Introduction

In the last decade there has been a dramatic increase in the performance and output of medical and scientific research in the Arab region, particularly among stable high-income economies such those of the Gulf Cooperation Council. In the case of Qatar, the country has committed 2.8% of its gross domestic product towards higher education, science and technology and academic research (1). Assessment of progress in biomedical research is crucial for developing evidence-based improvement in the health-care systems in the Arab countries and also reflects the prominence of a country in the global scientific community. To date, however, the scientific potential of clinical research in Qatar has not been explored well.

Blunt trauma is a serious public health concern in this rapidly developing country and is associated with significant morbidity and mortality among the younger age groups of the population (2,3). Road traffic accidents, falls from height and injuries from heavy objects are the frequently observed mechanisms of injury in the country (4,5). Similarly, the incidence of traumatic injuries is rising in Qatar (6). Around two-thirds of all injury-related mortalities in Qatar are due to road traffic accidents, and the younger age population has a higher rate of fatalities than other age groups (7). Qatar is the third wealthiest nation in the world, having the 11th highest motorization rate (721 motor vehicles per 1000 population), which goes some way towards explaining its high fatality rates (3.3 deaths per 10 000 motor vehicles) (5,8). Nevertheless, as in many developing countries, little consideration has been given to population-based studies on the incidence, mechanisms of injury, outcomes and prevention of traumatic injuries. Each country has unique socio-economic factors which influence the potential areas for injury prevention and

development of trauma services. Therefore there is a need to encourage more trauma research and reporting in Qatar to facilitate evidence-based practice and ultimately to improve patient care.

Hamad Medical Corporation is the leading health-care provider in Qatar and offers an array of primary, acute and tertiary care services to all residents of the country. In view of the disproportionately high incidence of unintentional injuries in Qatar (2), a trauma care system was established at Hamad General Hospital in 2008 and a trauma research unit was set up in June 2011. Establishing a clinical research unit in trauma could be an appropriate model to demonstrate the improvement in research outcomes with investment in dedicated a trauma research infrastructure in Qatar. This review aimed to analyse trauma research publications that have originated from Qatar and discuss the progress of clinical research in Qatar with special emphasis on trauma research.

Methods

A literature review was performed to identify all relevant biomedical research publications originating from Qatar in the areas of internal medicine, surgery and trauma. An online search was made using *PubMed*, *Medline* and *Google Scholar* search engines from January 1993 to December 2013. The medical subject headings (MeSH) used were "Qatar" [MeSH Terms] OR "Qatar" [All Fields] AND ("1993/01/01" [PDAT]: "2013/12/31" [PDAT]). We searched research publications by country name, as we intended to include all relevant articles published from Qatar. We manually reviewed all the obtained abstracts. Although this approach is labour-intensive, it yielded more accurate results. All these articles were then included for the review analysis. Articles written in English which were available on electronic databases and

specific institutional sites were included in this study.

A total of 1781 publications were retrieved from the *PubMed* database with the keyword "Qatar", of which 671 articles originated from Qatar, and 86 articles were identified and included from a *Google Scholar* search. All articles were studied manually to look for institutional affiliations and were classified according to publication type (research studies, reviews, case reports, clinical trials and editorials) and were categorized as *Medline*, *PubMed* and *Scholar* articles. A total of 1110 articles were not included in the analysis because they presented data from other countries. Non-English language articles and articles with no abstract were excluded. The publications identified through the search were independently screened by two authors for inclusion, which resulted in 757 articles selected for review.

Results

Of the 757 articles identified within the 21-year search window nearly two-thirds ($n = 486$, 64%) were published during 2009–13, the last 5 years of the search period (Table 1). These articles in the fields of internal medicine, surgery and trauma mainly included retrospective ($n = 167$), prospective ($n = 115$) and cross-sectional ($n = 62$) research studies and a few case-control ($n = 17$) studies. There were a high number of case reports/series ($n = 244$) and review articles ($n = 107$). Editorials ($n = 17$), clinical trials ($n = 11$) and book chapters ($n = 3$) were published less frequently. The great majority of clinical medicine publications originated from institutions affiliated to Hamad Medical Corporation (82%) (Table 2), whereas the other research institutions in Qatar published a relatively low proportion of articles (14%) during the same period.

We made a more detailed review of research articles concerning trauma

Table 1 Details of clinical research publications (medical, surgical and trauma) originating from Qatar, 1993–2013

Variable	Pub/Med (n = 671) ^a	Scholar (n = 86)	Total (n = 757)
	No.	No.	No.
Original research paper			
Retrospective study	149	18	167
Prospective study	111	4	115
Case series/case report	223	21	244
Cross-sectional study	59	3	62
Clinical trial study	10	1	11
Case-control study	17	0	17
Other publication type			
Review article	87	20	107
Editorial/ letter to editor	14	3	17
Book chapter	0	3	3
Critique	0	5	5
Published abstract	0	8	8
Year of publication			
2013	137	21	158
2012	104	31	135
2011	65	13	78
2010	37	5	42
2009	70	3	73
2008	47	1	48
2007	24	2	26
2006	45	0	45
2005	10	0	10
2004	1	0	1
2003	17	0	17
2002	17	0	17
2001	21	0	21

^a452 articles were also Medline.

over the years 2001–2013, as trauma-related publications from Qatar started to appear from 2001 onwards. A total of 128 research publications were identified on the subject of trauma (41 were indexed in *Medline*, 40 in *PubMed* and 47 in *Google Scholar*). The majority of these ($n = 107/128$) were published between 2011 and December 2013. Among trauma publications, the most frequent types of study were retrospective analysis (36%), followed by case reports (20%) and review articles (17%). Prospective (7%) and cross-sectional (2%) studies and clinical trials (0.8%) were less common (Table 3). The

trauma research publications showed a steep rise from the year 2010 onwards (Figure 1).

Discussion

Clinical research in the GCC

The countries of the Gulf Cooperation Council (GCC)—Saudi Arabia, United Arab Emirates, Qatar, Bahrain, Kuwait and Oman—are the most rapidly developing countries in the Eastern Mediterranean Region. The discovery of vast oil reserves in these countries has led to a rapid

socioeconomic transformation which has stimulated investment in education quality and research in the region. However, recent reports have suggested that the research output from these countries are lagging behind from a global perspective (9,10). El-Azami-El-Idrissi et al. compared the medical research output of Arab nations with those of more developed countries during 1996–2012 (10). The authors found that the research output of Arab nations was only 4% of the United States of America but similar to that of Israel and twice that of the Islamic Republic of Iran. However, the average Hirsch index (11,12) of the Arab researchers, a measure of the quantity and quality of publications (based on the number of publications and citations), was lower compared with other nations. Qatar held the 5th place out of the 6 GCC countries both in world ranking (rank = 82) and h-index ($h = 35$) average (10).

Qatar has invested huge resources over the years to improve its health-care facilities and develop the infrastructure for modern educational and research institutions. Hamad Medical Corporation, Qatar Foundation, Weill Cornell Medical College in Qatar and Sidra Medical and Research Centre are the leading health-care and research organizations which represent Qatar at the international and regional level. The output of international publications is the primary criterion for the assessment of growth and development of biomedical research in a country (13), and the scientific activities of individual biomedical research institutions (national and international) are evaluated by the quality and quantity of publications (14,15). Yet to date the scientific potential of clinical research in Qatar has not been explored greatly. Currently Qatar is gaining momentum in the field of clinical and biomedical research, which is evident from the increasing number of scientific publications.

Table 2 Institutional affiliations of authors of clinical research publications originating from Qatar, 1993–13 (*n* = 671)

Institution	No.
Hamad Medical Corporation	
Alone	552
Jointly with Weill Cornell Medical College (Qatar)	18
Jointly with Weill Cornell Medical College (Qatar) and University of Manchester (United Kingdom)	4
Jointly with University of Manchester (United Kingdom)	4
Jointly with University of Bergen (Norway)	1
Other institutions	
Weill Cornell Medical College (Qatar)	38
University of Qatar	28
ASPATER Qatar Orthopedic and Sports Medicine Hospital	13
KIMS Qatar Medical Centre	2
University of Calgary (Qatar)	4
Other	7

Trauma research in Qatar

Traumatic injuries are one of the leading causes of deaths, affecting nearly 6 million people globally (12). Road traffic accidents account for nearly a quarter of deaths from all injuries and other main causes include falls, drowning, burns and poisoning (16). Road traffic accidents currently hold the 8th leading cause of all deaths and, without adequate preventive measures, will be the 5th leading cause of death by 2030 (12). Since trauma remains a leading cause of unintentional injuries and deaths in our region, our review focused primarily on progress in trauma research

in Qatar, which could be a benchmark for other countries in the region. Local trauma researchers play a central role in the development of innovative trauma programmes and research translation, which eventually can make a contribution to evidence-based patient care and injury prevention strategies.

Given the diversity of organizations and the dynamic nature of trauma care systems, it is valuable to conduct research which could improve the effectiveness of the national trauma system through continuous system development and performance improvement. Research outcomes provide valuable

information for establishing best clinical practices and facilitating system development for improved patient care.

In this review in Qatar, we found an increase in all types of medical, surgical and trauma research publications since 2011. The majority of these originated from institutions affiliated to Hamad Medical Corporation (82%). When we analysed only trauma research, we found that publications showed a steep rise from the year 2010 onwards and the majority of papers (107/128) were published between 2011 and December 2013, 3 years after the establishment of the trauma research unit. It was observed that trauma research publications increased nearly 4-fold after 2011, i.e. reached 38 published research papers in 2013 from an average of 2 papers per year across the period from 2001 to 2010. Table 4 shows a comparison of the total number of medical research publications among different Arab countries from 1996–2012 and the number of trauma research papers. Saudi Arabia (*n* = 181) and the United Arab Emirates (*n* = 122) contributed more than half of the total trauma publications in the GCC region, followed by Kuwait (*n* = 78) and Qatar (*n* = 74). The lowest contributions were from Oman (*n* = 34) and Bahrain (*n* = 22). Qatar published 6% (1748/28 623) of the total medical research publications from

Table 3 Types of trauma publications originating from Qatar, 2001–2013

Study/publication type	PubMed (<i>n</i> = 40)	Medline (<i>n</i> = 41)	Scholar (<i>n</i> = 47)	Total (<i>n</i> = 128)	
	No.	No.	No.	No.	%
Retrospective study	18	17	11	46	35.9
Prospective study	4	5	0	9	7.0
Case series/case report	12	8	6	26	20.3
Review article	4	7	11	22	17.2
Cross-sectional study	1	2	0	3	2.3
Clinical trial study	0	1	0	1	0.8
Editorial/letter to editor	1	1	3	5	3.9
Book chapter	0	0	3	3	2.3
Critique	0	0	5	5	3.9
Published abstract	0	0	8	8	6.3

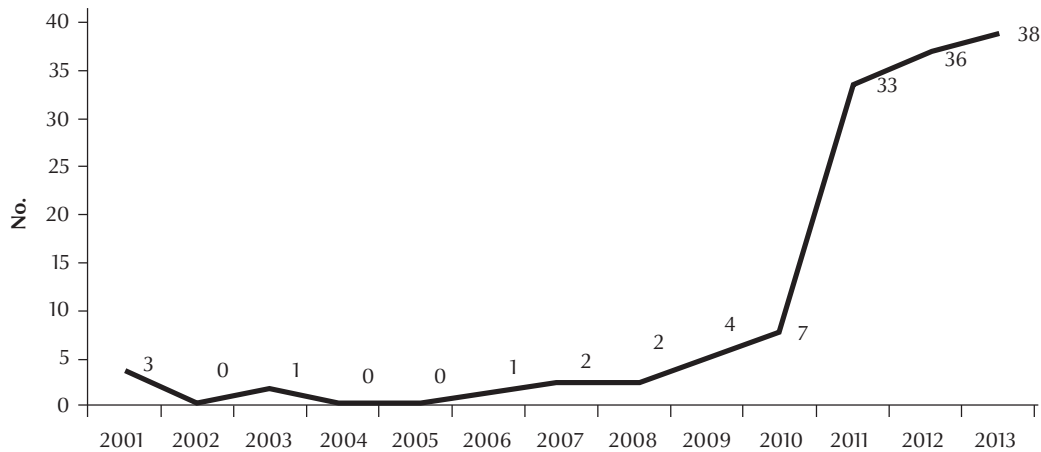


Figure 1 Trend in trauma research publications originating from Qatar, 2001-2013

GCC countries but 15% (74/511) of the trauma research publications. Thus the trauma research unit can serve as a model to demonstrate the improvement in research outcomes with investment in a dedicated trauma research infrastructure in Qatar.

Quality and types of trauma research publications in Qatar

Not only is the quantity of published works a concern, but also the quality especially in the light of the low average h-index of articles published by the researchers in the Arab region. Although *PubMed* and *Google Scholar* are not an indication of the quality of the articles, we utilized these common scientific databases of biomedical information due to their accessibility and comprehensiveness. *PubMed* retrieved 63% of

the trauma research articles included in our review. *PubMed* includes *Medline*, which is the National Library of Medicine journal citation database set up in the 1960s. *Medline (PubMed)* indexing is advantageous as the database only includes journals that meet the criteria of timely publication, a robust peer review system and adherence to ethical guidelines. Our study found that 1 out of 3 trauma research articles in Qatar published in *PubMed* was indexed for *Medline*. Falagas et al. compared the content coverage and practical utility of *PubMed*, *Scopus*, *Web of Science* and *Google Scholar* and found that *PubMed* remains an important, frequently updated resource for clinicians and researchers (17). Although *Google Scholar* can retrieve most of the information, the inadequate and rare up-

dating of citations affects the quality of the information retrieved.

When we analysed the types of trauma research publications, we found that the most frequent types of study were retrospective studies, case reports and review articles, while prospective studies constituted a smaller proportion. The poor representation of prospective studies, including few clinical trials compared with observational studies, highlights the existing gaps in research practice in Qatar. Retrospective study designs are often considered inferior (level III evidence) to prospective study designs (level II evidence). However, in the case of road traffic accidents and traumatic injury in general, retrospective analysis is the only feasible approach, whereas randomized clinical trials could be inapplicable and even unethical in

Table 4 Comparison of number of medical research publications originating from different Arab countries, 1996-2012

Country	Population mid-2013 (millions)	No. of medical schools/ hospitals	Total no. of publications	No. of trauma publications
Saudi Arabia	30.1	21/115	16 169	181
United Arab Emirates	9.3	5/120	3 583	122
Bahrain	1.1	3/24	1 310	22
Kuwait	3.5	1/40	3 706	78
Qatar	2.2	1/12	1 748	74
Oman	4.0	2/53	2 107	34
Jordan	7.3	5/105	3 624	72
Egypt	84.7	19/175	15 350	170

certain trauma-related situations. Hess suggested that a retrospective study design should not be preferred over a prospective design, if feasible (18). The high representation of retrospective studies could be related to the inexpensive nature, ease of obtaining existing records and lower ethical considerations from institutional review boards as compared with prospective designs. Prospective studies require informed consent from patients, which remains a major challenge in developing countries (19).

Other reasons for the poor representation of prospective designs in Qatar could be the bureaucratic and cultural barriers for conducting human subject research. Although compliance with ethical standards has made research safer for research subjects, the working processes of ethics committees and institutional review boards should be explored to understand their impact on health research in Qatar. Alahmad et al. recently explored national research ethics regulations and guidelines in Arab countries including Qatar and demonstrated numerous deficiencies that exist in the systems as compared with international standards (20). Hansson et al. pointed out that although the ethics review process aims to protect all research participants

against any potential harm associated with biomedical research, this process, in itself, could produce more harm than good in certain instances, and so it should be reconsidered and modified (21).

Hamad Medical Corporation trauma care centre

To facilitate evidenced-based practice and improved patient care in Qatar, the Hamad Medical Corporation trauma research unit was set up at Hamad General Hospital in June 2011. Figure 2 summarizes the types of research activities at the trauma research centre. The trauma care centre utilizes the trauma registry database to audit performance based on a comprehensive performance improvement and a patient safety programme. This registry is an active participant of the National Trauma Data Bank and Trauma Quality Improvement Program of the Committee on Trauma of the American College of Surgeons. As such, it collects standard data in accordance with Trauma Quality Improvement Program standards and these are submitted to them on a quarterly schedule. We have also started a trauma critical care fellowship programme to bridge the postgraduate studies such as residency and other programmes to clinical fellowship.

Since 2011, there has also been a significant increase not only in the number of research publications by institutions affiliated to Hamad Medical Corporation, as shown in the results of this review, but also in the dissemination of trauma research results through presentations at international congresses by our trauma team (38 presentations in 2011; 52 in 2012 and 53 in 2013). Presentation of our findings at leading international trauma conferences facilitates dissemination of research output and provides a channel for exchange of information, international collaboration and representation of this rapidly developing country to the international community. Our trauma research unit also supports best clinical practice through implementation of clinical practice guidelines, education and training for clinical staff and improvement of quality of care through audit and feedback. It has been observed that evidence-based practice in trauma and critical care helps us to provide better health-care facilities and proper utilization of the hospital.

Recently, the Hamad Medical Corporation trauma centre has been awarded 5 grants for 5 trauma research projects that tackled important issues, including occupational injuries in Qatar, use of car seats for children,

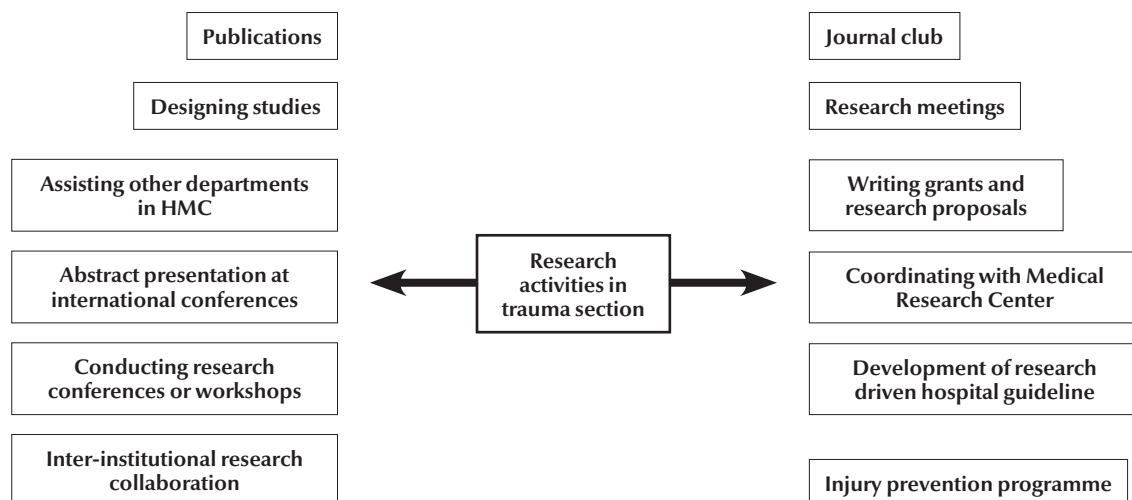


Figure 2 Trauma research activities at the Hamad Medical Corporation trauma centre

organ donation awareness in the community, hypothermia in the early management of head injury and the clinical assessment of thoracolumbar traumatic injury. These projects received grants of around \$US 4 million and are carried out in collaboration with United States and Australian institutes. After establishing the trauma research unit, the trauma team gained direct contact with all the stakeholders concerned with trauma and its prevention in Qatar, such as the ministries of interior, labour and education, universities, media and public campaigns. This was strengthened by adding an injury prevention unit to the trauma services in 2012.

Benefits and challenges of trauma research

Earlier research has highlighted the effectiveness of trauma systems in improving the survival rate of trauma patients through delivering the right care to the right patient at the right time (22). Therefore, research remains an important element of trauma care systems. Research drives the system and provides the foundation for system development and performance improvement. After reviewing 5598 abstracts, of which 1187 referred to a trauma registry from 1998 to 2013, Al-Thani et al. developed a 3 × 3 model to evaluate the impact of the number and quality of registry-based publications in a given country on the delivered trauma care. The authors concluded that the quality of publications reflects the efficiency of a trauma system and its maturation (23).

Translation of the knowledge gained from research into practice is much needed for strengthening trauma systems, and this eventually helps in prevention and management of unintentional injuries and deaths. For instance, a recent study by our team evaluated time-based trauma mortality patterns in the newly established trauma centre in Qatar. We observed a higher rate of mortality at the scene, highlighting the need for advanced pre-hospital trauma care and injury

prevention programmes (24). Moreover, even in established trauma systems, the numbers of preventable deaths are comparatively low. Since our trauma care centre is progressing towards the development of a mature trauma system, we believe that the impact of the trauma research centre on trauma prevention, management and reduction in numbers of preventable deaths and improvement in the quality of life of survivors will be evident in the near future.

The major constraint for trauma research is the surrounding conditions, which are highly pressured, immediate and emotional and often overburdened for the scope of research (25). It can be slow or inexistent due to time and financial constraints as well as a lack of a research tradition (25). Some investigators suggested that limited resources, lack of experience in designing research and lack of institutional support are other challenges in conducting research in emergency and trauma settings (26). In particular, a lack of qualified researchers in trauma settings hinders the core competencies of the interested emergency physicians in addressing critical issues.

One of the limitations of this review was the primary focus on the broad specialties of medical, surgical and trauma research in Qatar, which renders other types of research from Qatar unexplored. Although the trauma research unit is presented as a model to demonstrate the improvement in research outcomes with investment in a dedicated trauma research infrastructure in Qatar, research from other sub-specialties is still in its early stages when compared with that from developed nations and requires huge support for infrastructure, funding and high-quality training.

Moreover, trauma research in Qatar is primarily supported by observational studies, which provide lower quality of evidence and so there is a need to encourage more clinical trials and prospective studies to improve the quality of research that will improve clinical care for trauma patients in Qatar. The major

challenge to conducting prospective studies is the requirement for informed consent from patients, which remains a serious issue attributed to sociocultural barriers. To encourage prospective studies, we believe that the informed consent forms, which are often copies of forms used in Western countries, and the alternatives (i.e. deferred and waiver of consent), need to be revised to be more suitable to local culture and religious beliefs. The under-representation of women in clinical research in our region is another challenge which needs a special focus (27). Unfortunately, the lack of dedicated and trained clinical researchers, the complicated process of obtaining informed consent for clinical studies and a lack of support for research activities are the most common obstacles for trauma research in the developing world.

In conclusion, around 84% of the total trauma research articles from Qatar were published after the establishment of the trauma research unit in June 2011. The increased number of research publications in recent years demonstrates an increased level of participation in trauma research and points to the progressive maturation of the trauma care system in Qatar. We believe that establishing a research unit has made a major impact on research productivity, which ultimately benefits health care. To continue improving the care of the injured, greater research endeavours are crucial and should be encouraged for better understanding and development of an advanced trauma care management system.

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