Iran Red Crescent Med J. 2016 May; 18(5): e23075. doi: 10.5812/ircmj.23075

Published online 2016 February 14. **Research Article**

Situational Analysis of Essential Surgical Care Management in Iran Using the WHO Tool

Rohollah Kalhor,[1] Nastaran Keshavarz Mohamadi,[2] Nader Khalesi,[1,3] and Mehdi Jafari[1,3,*]

[1]Department of Health Services Management, Iran University of Medical Sciences, Tehran, IR Iran
[2]School of Public Health, Shahid Beheshti University of Medical Sciences, Tehran, IR Iran
[3]Health Management and Economics Research Center, Iran University of Medical Sciences, Tehran, IR Iran

*Corresponding Author: Mehdi Jafari, Department of Health Services Management, Iran University of Medical Sciences, Tehran, IR Iran. Tel: +98-9123210131, E-mail: mjafari@iums.ac.ir

Received 2014 August 26; **Revised** 2014 September 29; **Accepted** 2014 October 18.

Abstract

Background: Surgery is an essential component of health care, yet it has usually been overlooked in public health across the world.

Objectives: This study aimed to perform a situational analysis of essential surgical care management at district hospitals in Iran.

Materials and Methods: This research was a descriptive and cross-sectional study performed at 42 first-referral district hospitals of Iran in 2013. The World Health Organization (WHO) Tool for the situational analysis of emergency and essential care was used for data collection in four domains of facilities and equipment, human resources, surgical interventions, and infrastructure. Data analysis was conducted using simple descriptive statistical methods.

Results: In this study, 100% of the studied hospitals had oxygen cylinders, running water, electricity, anesthesia machines, emergency departments, archives of medical records, and X-ray machines. In 100% of the surveyed hospitals, specialists in surgery, anesthesia, and obstetrics and gynecology were available as full-time staff. Life-saving procedures were performed in the majority of the hospitals. Among urgent procedures, neonatal surgeries were conducted in 14.3% of the hospitals. Regarding non-urgent procedures, acute burn management was conducted in 38.1% of the hospitals. Also, a few other procedures such as cricothyrotomy and foreign body removal were performed in 85.7% of the hospitals.

Conclusions: The results indicated that suitable facilities and equipment, human resources, and infrastructure were available in the district hospitals in Iran. These findings showed that there is potential for the district hospitals to provide care in a wider spectrum.

Keywords: Surgery, Intensive Care, Emergency Medical Services, Hospitals

1. Background

Preliminary estimates show that 11% of the global burden of disease is manageable by surgery (1). However, surgical procedures have their own complications and risks. Even with conservative estimates, each year 7 million people suffer from complications caused by surgery, while probably half of them are preventable. Studies have also shown that the rate of major complications caused by surgery for hospitalized patients in developed countries is 3 - 6%, accounting for 0.4 - 0.8% of total mortality, as opposed to 5 - 10% in developing countries (2). What is more, the performance of organizations providing surgical care in low- and middle-income countries (LMICs) is not satisfactory (3). Only 3.5% of major surgical procedures are performed in low-income countries, while they account for 1.3% of the world's population (4).

In addition to the quality of surgical procedures, the cost-effectiveness of surgeries is a very important issue which is different between countries. Available evidence suggests that the cost-effectiveness of essential surgical care in LMICs is not appropriate (1). Furthermore, in LMICs surgical knowledge is not sufficient. It seems that although surgery is an integral component of health care, it is generally neglected in these countries (5, 6). To tackle the above problems and reduce inequity in the quality and quantity of surgical care in the world, especially in LMICs, in December 2005, The world health organization (WHO) launched a global initiative on emergency and essential surgical care. This initiative includes educational materials, designing a tool for data collection regarding the quantity and quality of surgical care and emergency care (standard tool for situational analysis), and preparing and completing a global atlas for essential surgical care (5).

The health system of Iran provides care in three levels. The first level comprises primary health care, the second level delivers both inpatient and outpatient specialized health services by hospitals and health centers, and the third level provides subspecialty services as inpatient and outpatient services. These services are under the supervision of medical universities in each province. The medical universities based on their educational, research, and medical facilities, and also on the indictors of provincial health are divided into three types. Type I universities have more facilities and better health indicators than the other two types (7). Based on this grouping, 31% of hospitals are managed by type I universities, 52% by type II, and 17% by type III universities.

2. Objectives

This study, originally presented as a PhD thesis, aims to address the current dearth of information on the status of surgical care in Iran and also to introduce and implement strategies suggested by the WHO for the universal and effective management of essential surgical care in Iran.

3. Materials and Methods

This research was a descriptive and cross-sectional study performed at 42 first-referral district hospitals in Iran in 2013 selected via the randomized sampling method. In June 2012, the study protocol was approved by the Ethics Committee of Iran University of Medical Sciences (Project # 344). General, governmental and non-educational hospitals which had active operating rooms were included in this study. General private or charity hospitals as well as those in provincial capitals were excluded from the study. First, the hospitals that met the inclusion criteria were determined. As is shown in Table 1, there were 68 hospitals in type I universities, 113 in type II, and 37 in type III. Then, due to the large number of the qualified hospitals, according to the proportion of each type of university hospitals, it was decided to choose 3 hospitals for each type I university, 2 hospitals for each type II university, and one hospital for each type III university. Consequently, via random sampling, the present study included 73 hospitals, 42 of which responded with completely answered questionnaires and they were eligible to be included in the final data analysis.

The study tool was a questionnaire developed by the WHO in 2003 for the situational analysis of emergency and essential surgical care (8, 9). This tool is used to assess surgical needs in many developing countries and has been translated into Farsi and validated and employed in Iran by Mouseli (2009) (10-12). However, the researcher improved and completed the translation of the tool before it was utilized. The questionnaire consisted of 138 questions in four parts, encompassing general information about the hospital, surgical and anesthetic infrastructure, human resources for surgery, surgical interventions and services, and equipment for surgery and resuscitation. The face validity of the questionnaire was confirmed by professionals. The reliability of the questionnaire was evaluated by calculating Cronbach's α for 7 filled questionnaires, which yielded 77.7% internal co-efficiency. Thereafter, the questionnaire was filled after obtaining the consent of the directors of the studied hospitals and ensuring the confidentiality of the information. The data were analyzed via descriptive statistics (i.e. frequency, percentage, and ratio) using the SPSS software (version 16).

4. Results

4.1. The Characteristics of Centers

Among the studied hospitals, there were 16 (38.1%) type I, 19 (45.2%) type II, and 7 (16.7%) type III university hospitals. The total population covered by these 42 hospitals was 5637688, and the mean of the population covered by each hospital was 134230.67 ± 67496.22. The average number of the active hospital beds was 94.55 ± 44.74, and the mean number of the operating rooms was 3.36 ± 1.62. The mean distance to the next health center in the next level was 120.57 ± 88.66 km.

4.2. Basic Infrastructure

As the data presented in Table 2 show, the highest numbers of approved beds and active beds were 200 and 220, respectively. The highest number of the operating rooms was 8, with a mean number of 3.36. Additionally, the mean number of the admitted patients was 15186.10, the mean number of the patients that underwent surgery was 3249.73, the mean number of the operated children younger than 15 years old was 279, and the mean number of the patients that were referred to more equipped centers for surgery was 233.89.

Table 1. Frequency of the Qualified Universities and Hospitals

University	Qualified University No.	Qualified Hospitals No.	Sample No.	Received Complete Questionnaire	Response Rate, %
Type I	7	68	21	16	76
Type II	19	113	38	19	50
Type III	14	37	14	7	50
Total	40	218	73	42	58

Table 2. Size of the Hospital, Number of Active Operating Rooms, Number of Patients Admitted, and Number of Patients Referred to the Next Level in the Studied Hospitals in 2013

Item	Hospital No.	Minimum	Maximum	Mean ± SD
Approved Hospital Beds	42	33	200	97.24 ± 40.14
Active Beds	42	19	220	94.55 ± 44.74
Total Number of Functioning Operating Rooms	42	1	8	3.36 ± 1.62
Total Number of Admissions in One Year	41	1093	42748	13478.78 ± 9328.26
Total Number of Surgeries Performed in One Year	41	254	9957	3249.73 ± 2466.35
Number of Children (Aged Less than 15 Years Old) Operated at this Facility	33	0	1200	279 ± 324.79
Number of Patients Referred to the Next Level for Surgical Intervention per Year	29	0	950	233.89 ± 247.02

Regarding infrastructure, our results showed that all the hospitals had oxygen cylinders, running water, electricity, functioning anesthesia machines, emergency departments, archives of medical records, and functioning X-ray machines. The least available facilities were central oxygen (27 [64.3%] hospitals) and blood banks (28 [66.71%] hospitals).

4.3. Human Resources

In all the hospitals, regardless of their types, specialists in surgery, anesthesia, and obstetrics and gynecology were available full time. To complete expert staff, part-time specialists were also employed. In addition, none of the general practitioners or nurses that were qualified or had performed surgery or anesthesia was reported as hospital staff.

4.4. Surgical Interventions

As is shown in Table 5, cricothyroidotomy was offered only in 85.7% of the hospitals and foreign body removal in 85.7%. Among urgent procedures, neonatal surgeries were conducted in 14.3% of the hospitals, open treatment of fractures in 71.4%, and amputation in 66.7%. From non-urgent procedures, acute burn management was conducted in 38.1% of the hospitals, urethral stricture dilatation in 64.3%, cleft-lip repair in 31%, and release of contracture tissue in 52.4%. All the hospitals offered regional, spinal, and general anesthesia.

Table 3. Situation of Required Surgical Infrastructure in the Studied Hospitals in 2013

Hospital Infrastructure	Type I (n = 16)	Type II (n = 19)	Type III (n = 7)	Total (n = 42)	Percentage
Oxygen Cylinder Supply	16	19	7	42	100
Oxygen Concentrator Supply	13	10	4	27	64.3
Running Water	16	19	7	42	100
Electricity Sources	16	19	7	42	100
Operational Power Generators	16	19	6	41	97.6
Functioning Anesthesia Machines	16	19	7	42	100
Medical Recording	16	19	7	42	100
Area Designated for Emergency Care	16	19	7	42	100
Area Designated for Postoperative Care	16	18	7	41	97.6
Management Guidelines for Emergency Care	15	18	7	40	95.2
Management Guidelines for Surgery	14	18	7	39	92.2
Management Guidelines for Anesthesia	14	18	7	39	92.2
Management Guidelines for Pain Relief	15	18	7	40	95.2
Blood Banks	14	12	3	28	66.7
Facility to Test Hemoglobin and Urine	13	12	3	41	97.6
Functioning X-Ray Machines	16	19	7	42	100

Table 4. Number of Full-Time and Part-Time Human Resources Based on the University Type in 2013

Hospital Human Resources	Type I (n = 16)		Type II (n = 19)		Type III (n = 7)		Total (n = 42)	
	Full Time	Part Time	Full Time	Part Time	Full Time	Part Time	Full Time	Part Time
Surgeons (Qualified)	74	28	79	24	30	9	183	61
Anesthesiologists (Qualified)	33	7	37	18	20	5	90	30
Obstetricians/Gynecologists (Qualified)	53	10	41	16	14	5	108	31
Paramedics/Nurses/Midwives [a]	1677	2	2309	0	1430	0	5416	2
Total	1837	47	2466	58	1494	19	5797	124

[a] Number of the Paramedics and Nurses is Related to All the Wards of the Hospital and Not Just Surgery.

Table 5. Status of Surgical and Anesthesia Care in the General Hospitals of Iran Based on the University Type in 2013

Hospital Procedures	Type I (n = 16)	Type II (n = 19)	Type III (n = 7)	Total (n = 42)
Life-Saving Procedures				
Resuscitation (Airway, Hemorrhage, etc.)	100	100	100	100
Cricothyroidotomy	75	94.7	85.7	85.7
Chest Tube Insertion	100	100	100	100
Removal of Foreign Body (Throat/Eye/Ear/Nose)	87.5	84.2	85.7	85.7
Urgent Procedures				
Hernia Repair (Strangulated, Elective)	100	97.4	100	97.6
C-Section	93.7	100	100	97.6
Curettage	93.7	100	100	97.6
Appendectomy	100	89.4	100	97.6
Cystostomy	68.7	78.9	71.4	73.8
Laparotomy (Uterine Rupture, Ectopic Pregnancy, etc.)	93.7	100	100	97.6
Neonatal Surgery (Abdominal Wall Defect, Colostomy, Imperforate Anus, and Intussusceptions)	0	21	28.5	14.3
Open Treatment of Fracture	56.2	78.9	85.7	71.4
Emergency Amputation	43.7	84.2	71.4	66.7
Non-Urgent Procedures				
Acute Burn Management	50	42.1	0	38.1
Incision and Drainage of Abscess	100	100	100	100
Wound Debridement	100	100	100	100
Suture of Superficial Wounds	100	100	100	100
Obstetric Fistula Repair	87.5	89.4	71.4	85.7
Management of Hydrocele	93.7	94.7	100	95.2
Male Circumcision	100	84.2	71.4	88.1
Urethral Stricture Dilatation	50	73.6	71.4	64.3
Congenital Hernia Repair	87.5	73.6	100	83.3
Cleft-Lip Repair	25	36.8	28.5	31
Club-Foot Repair	31.2	42.1	28.5	35.7
Contracture Release, Skin Grafting	43.7	57.8	57.1	52.4
Closed Treatment of Fracture	56.2	84.2	100	76.2
Joint Dislocation Treatment	56.2	83.3	100	73.8
Osteomyelitis/Septic Arthritis	62.5	63.1	85.7	66.7
Biopsy (Lymph Node, Mass, Other)	87.5	94.7	100	92.9
Cataract Surgery	50	57.8	71.4	57.1
Anesthesia Service				
Regional Anesthesia Blocks	100	100	100	100
Spinal Anesthesia	100	100	100	100
Ketamine Intravenous Anesthesia	62.5	78.9	85.7	73.8
General Anesthesia Inhalational	100	100	100	100

4.5. Equipment and Supplies

The present study showed that the most common shortage was in arm and leg splints, reported by 47.6% of the hospitals. Cricothyroidotomy sets and artery forceps were available in 57.1% and 78.5% of the hospitals, correspondingly. The other required supplies were always available in most of the hospitals (over 85%).

Table 6. Equipment and Supplies in 2013 [a]

Hospital Items	Type I (n = 16)	Type II (n = 19)	Type III (n = 7)	Percentage of Centers Reporting Availability All the Time (n = 42)
Surgical				
Gloves (Sterile)	93.7	89.4	100	92.8
Vaginal Speculums	93.7	78.9	100	88
Straight Scissors (12 cm)	100	89.4	100	95.2
Blunt Scissors (14 cm)	93.7	94.7	100	95.2
Artery Forceps	75	73.6	100	78.5
Toothless Kocher Forceps	87.5	84.2	100	88
Face Masks	93.7	89.4	85.7	90.4
Sterilizer	100	89.4	100	95.2
Sterile Gauze Dressing	93.7	94.7	85.7	92.8
Retractors	87.5	73.6	100	83.3
Tourniquets	93.7	89.4	100	92.8
Cutting and Round-Bodied Needles	93.7	89.4	71.4	88
Urinary Catheters	100	89.4	100	95.2
Cricothyroidotomy Sets	62.5	52.6	57.1	57.1
Synthetic Absorbable Sutures	93.7	84.2	85.7	88
Nasogastric Tubes	100	94.7	85.7	95.2
Splints for Arms and Legs	50	42.1	57.1	47.6
Chest Tube Insertion Equipment	93.7	84.2	100	90.4
Light Sources (Lamps and Flashlights)	100	89.4	100	95.2
Eye Protection	93.7	78.9	100	88
Anesthetic				
Stethoscopes				97.6
Sphygmomanometers				97.6
Intravenous Fluid Infusion Sets				98.5
Suction Catheters (Size 16 FG)	100	89.4	75	85.7
Anesthesia Machines	100	100	100	100
Unstuffed Endotracheal Tubes (Sizes 3.0 to 5.0)	85.7	94.7	100	95.2
Laryngoscope Blades (Adults)	100	94.7	100	97.6
Cuffed Endotracheal Tubes (Sizes 5.5 to 9)	85.7	89.4	100	92.8
Oxygen Sources	100	100	100	100
Suction Pumps (Manual or Electric)	100	94.7	100	97.6
Resuscitator Bag Valves and Masks (Adults)	100	94.7	93.7	95.2
Macintosh Laryngoscope Blades (Pediatrics)	85.7	94.7	87.5	90.4
Resuscitator Bag Valves and Masks (Pediatrics)	100	94.7	87.5	92.8

[a] Data are presented as %.

5. Discussion

The present study provides a general view of the current status of surgical and anesthesia services in first-level hospitals in the referral system in Iran, based on the WHO Tool. Our findings identified the gaps in the infrastructure, human resources, surgical interventions, and essential equipment and indicated that suitable facilities and equipment, human resources, and infrastructure are available in the district hospitals in Iran at a standard higher than that in many of the LMICs which have evaluated and published the status of their own essential

surgical care (11-17). Our results also showed a significant improvement in status by comparison with the situation 5 years ago in Iran.

This is the second study in Iran to have evaluated surgical care in the district hospitals using the WHO Tool. The first study was conducted in 2009 (10). The results of the present study, conducted 5 years after the previous one, showed that Iran has made significant progress in the different aspects of surgical care over the recent years (10). In the infrastructure domain, despite its wide geographical expanse, Iran has endeavored to provide its population with access to essential surgical care. Our results revealed that the mean number of the hospital beds in the 42 evaluated hospitals was 97.24, which shows a good increase compared with the figure (69 beds) reported in the previous study. More than 92% of the studied hospitals had management guidelines for surgery, anesthesia, pain relief, and emergency conditions. The reasons for the availability of these guidelines were the implementation of clinical governance and safe surgery services in the hospitals, as well as the requirement for accreditation programs for the hospitals (18). In comparison with 5 years ago, the surgical services have made headway in all aspects of the infrastructure domain (10). This indicates the good status of Iran's general hospitals in terms of infrastructure, which also suggests that more surgical services can be defined for the hospitals in this level.

Our findings also demonstrated that the status of surgical care in Iran compared with that in many developing and even some developed countries is good. In regard to infrastructure, the situation of Iran compared with that of other developing countries, which were studied using the similar assessment tool, was significantly better, such that it places Iran in the range of developed countries. In Mongolia, only 45% of the hospitals had power generators and 23% had blood banks (13). In Afghanistan, 41% of the hospitals had anesthesia machines and 40% had access to running water (14). In Gambia, oxygen sources, running water, and electricity were available in 77.8%, 50%, and 44.4% of the hospitals, correspondingly. Furthermore, most of the studied hospitals in these countries did not have management guidelines (15).

In terms of human resources, the Iranian Ministry of Health has made great strides in promoting surgical care by training more surgeons. Presently, 52 medical universities and medical faculties are active in Iran, which yearly accept 150 residents in general surgery in 27 universities, 181 anesthesia residents in 26 universities, and 224 obstetrics and gynecology residents in 27 universities (19). There is no shortage of human resources in Iran, but their distribution is far from equitable (20, 21) insofar as the expert human resources are less likely to work full time in disadvantaged provinces. It is notable that surgical services were provided only by surgeons, anesthesiologists, and obstetrics in the studied hospitals. Performing surgery and anesthesia by general physicians is illegal; therefore, none of the surveyed hospitals permitted general practitioners or other health care personnel to perform any surgery or anesthesia.

Considering human resources, Iran also has a very good condition compared to many developing countries. For example in Afghanistan, a study reported that only 64.7% of the hospitals had surgeons and 29.4% had anesthesiologists. In addition, 30% of Afghanistan's hospitals did not have gynecologists, which was one of the main reasons for the referral of patients to the next health level (14). In Mongolia, the presence of surgeons and anesthesiologists was not reported even as part time and only in limited hospitals did general physicians have the permission to perform anesthesia and surgery (13). In some studies, for example in Sierra Leone, only 10 surgeons were available for each 5.7 million population (16). Likewise, in the east region of Africa, there were 400 surgeons for more than 200 million people (17, 22).

In the surgical intervention domain, the situation in Iran seems satisfactory. Life-saving services such as resuscitation and chest tube insertion were offered by 100% of the hospitals. Cricothyroidotomy and foreign body removal were offered in 85.7% of the hospitals, and the other hospitals referred their patients to a higher level. For emergency surgeries like neonatal operations, most of the hospitals (85.7%) also referred their patients to a higher level. Services for acute burn, dilatation of urethral strictures, and cleft lip were provided in 38.1%, 64.3%, and 31% of the hospitals under study, respectively. The main reason for not offering these services as stated by the other hospitals was a lack of specialists, followed by a paucity of equipment. Mouseli in his study reported neonatal surgery and cleft-lip repair in 40% and acute burn treatment and dilatation of urethral stricture in 45% of the hospitals; these figures are not very different from our results (10). In the present study, all the studied hospitals provided anesthesia services, and only 26.2% of them did not offer anesthesia with Ketamine. The principal reason for this shortcoming was a lack of experts and equipment. In this domain, Iran's status is far more desirable than that in many developing countries. In Tanzania, equipment shortages precluded the provision of many life-saving procedures such as oxygen tubing, pulse oximetry, and pediatric intubation (11). In Gambia due to the inadequacy of human resources, Cesarean section and appendectomy were performed only in 58.8% of the hospitals (15).

With respect to equipment, the Iranian Ministry of Health has tried to improve surgical care by equipping hospitals and paying special attention to operating rooms. Equipment and supplies, renewable items, and supplementary equipment were always available in all the hospitals in the current study. Only items like arm and leg splints (47.6%) and cricothyroidotomy sets (57.1%) were not always available in the studied hospitals. The

availability of equipment showed that there has been a good improvement in this area since the last study in Iran (10). In this regard, Iran's situation was superior to that in many other developing countries. In Mongolia, the availability of arm and leg splints and cricothyroidotomy sets was reported in 14% and 18% of the hospitals, correspondingly. In addition, oxygen sources, suction pumps, and resuscitator bag valves and masks (for adults) were only supplied in 9% of the hospitals in Mongolia (13). In contrast, our findings showed that the same pieces of equipment were, respectively, available in 100%, 97.6%, and 95.2% of the hospitals evaluated.

The limited number of the studied hospitals compared with the total district hospitals (42 vs. 218) may limit the generalizability of our results to all surgical care in all districts and is, as such, one of the limitations of the present study. Another drawback of note is that the quality of the provided surgical services was not assessed in this study. Furthermore, it is possible that because of the weaknesses in the Hospital Information System (HIS) in some hospitals, the accurate number of the patients referred to next levels was not reported.

Considering the defined level of services for these hospitals on the basis of the findings of the current study, it is advisable that a revision be made to these services with a view to expanding the spectrum of the provision of care. By encouraging health care personnel, especially surgeons and anesthesiologists, to render their services in small towns, it will be possible to provide better quality services at higher levels and reduce referral rates. Moreover, the attainment of this goal requires a more equitable distribution of specialists to reflect the acceptable status of equipment distribution in Iran. It is deserving of note that very few studies have hitherto been conducted on the performance of district hospitals, not least in the field of surgical services. The present study, thus, sought to present a general view of the current status of surgical services at Iranian district hospitals.

Acknowledgements

This study was part of a PhD thesis supported by Iran University of Medical Sciences (grant # IUMS/SHMIS-2012/344). We would like to extend our gratitude to the participants in the 42 hospitals across the country for participating in this study and completing the questionnaires.

Footnotes

Authors' Contribution: All the authors had a role in designing the study. The second author played a role in conducting the data analysis and data interpretation. All the authors contributed to the data acquisition and the writing of the preliminary draft of the manuscript.

Funding/Support: The authors received financial support from Iran University of Medical Sciences.

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