ORIGINAL ARTICLE

Perioperative Death in Malaysia: The Transition Phase from a Developing Nation to a Developed One

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Summary

This paper examines the surgical pathology associated with perioperative deaths in a country that is undergoing the transition from a developing to a developed nation status. The data from an ongoing nation-wide perioperative mortality study was prospectively collected for the period July 1996 to December 1997 and analyzed. The surgical pathology related to perioperative deaths in Malaysia is different from other developing and developed countries. While death from trauma and the late presentation of surgical conditions are similar to developing countries, infective gastrointestinal conditions were rarely encountered. Diseases associated with advanced age such as colorectal cancer, peptic ulcer, urological diseases and vascular conditions are beginning to emerge. As the country races towards a developed nation status, increasing life expectancy and changing life-styles are expected to influence the disease pattern. The planning of surgical facilities and manpower development must recognize the changes taking place.

Key Words: Perioperative deaths, Surgical pathology, Developing countries

Introduction

The economic status and the changing socio-cultural behavior of the population have a major influence on the spectrum of pathology and surgical practice [1,2,3]. Whilst diseases related to advanced age are an important cause of perioperative death in developed countries, trauma and infective conditions are perceived to be the main causes of surgical deaths in developing countries [4,5,6,7,8]. Malaysia, although a developing country has enjoyed sustained economic growth since independence in 1957 and has developed a high level of health care9. This rapid progress in development should have had an influence on the spectrum of surgical illness. There is very little information in literature describing the disease pattern of a country that is undergoing the transition from a developing to a developed nation status. Such information is vital for heath care managers in the planning and development of surgical services, manpower and facilities. This study examines the surgical practice

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associated with perioperative deaths in Malaysia and highlights some the measures taken by the Ministry of Health to address the evolving problems.

Materials and Methods

In 1992, the Ministry of Health (MOH), Malaysia introduced a formal systematic nation-wide review of perioperative deaths called the "Perioperative Mortality Review" (POMR) to improve the quality of anaesthetic and surgical services. Perioperative death was defined as any death occurring within the duration of a single admission for a surgical procedure. Twenty MOH hospitals participated in the study and data was collected prospectively. Audit formats were designed to obtain information on the patient characteristics, the preoperative diagnosis, details of the operative procedure, nature and timing of surgery, grade of surgeon participating in operation and the perioperative care given. In addition, data was obtained on the use of intensive care or high dependency units. The American Society of Anesthesiologists' Physical Status (ASA) classification was used to stratify the preoperative physical status of the patient. The audit formats were made available at participating hospitals. Following the death of a patient subsequent to a procedure, the surgeon and the anesthetist were invited to complete separate audit formats. The completed formats were forwarded to the POMR Secretariat and a peer review committee comprising a group of surgeons and anesthetists from participating hospitals then assessed the audit documents periodically. In addition, the study retrieved demographic data from participating hospitals of all patients who died within the duration of the same admission following surgery. Nurse coordinators were appointed in these hospitals to retrieve data through a parallel reporting system. The data attested to the total number of perioperative deaths (denominator) against the deaths actually reported by the doctors. For this study all perioperative deaths for the period July 1996 to December 1997 in the ongoing POMR were included for analysis. All surgical disciplines were included except cardio-thoracic surgery, which was not available in the MOH during the period of study.

Results

Demographic characteristics

A total of 2092 perioperative deaths were recorded for 216,191 surgical procedures during the period of study and the crude mortality rate was calculated as 967 deaths per 100,000 procedures. The surgeons and anesthetists from the participating hospitals reported 1519 deaths, giving a reporting rate of 73% and these reports were analyzed. There was male predominance in the reported perioperative deaths, 1025 male patients (67.5%) and 494 (32.5%) female patients (M:F=2.1:1). The age distribution of the patients who died from surgery is shown in Figure 1. In this review, the age of all operated cases was not collected; therefore direct comparison of death rates for the same age group was not possible The number of deaths for neonates, infants and children (8.3%) can be considered high, as the volume of surgeries for this age group is usually low when compared to adults. Fifty two per cent of the deaths occurred in adults below the age of 60 years and 33% of the deaths occurred in patients 60 years and more.

Urgency of Procedures

Emergency surgery was identified as an important risk factor for perioperative deaths and the number of deaths after emergency surgery was substantially increased, 1300 (85.6%) when compared to 219 (14.5%) for elective surgery.

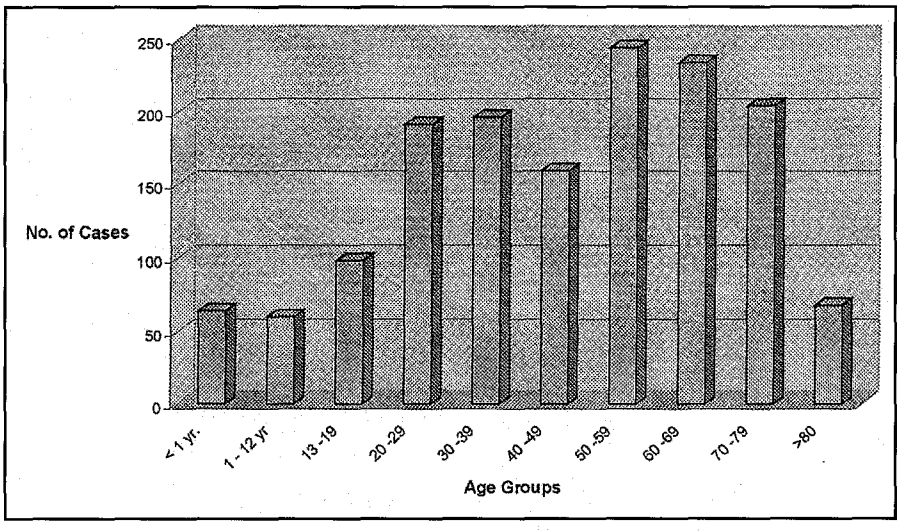

Fig. 1: Age Distribution Perioperative Deaths

ASA classification of perioperative deaths

Table I depicts the ASA stratification of the patients at the time of surgery. A significant number of patients were very ill at time of surgery and 919 (61.8%) of the deaths occurred in patients classified as ASA IV and V category.

Table I: ASA Classification of Deaths

ASA Class	Frequency	Percentage
1	48	3.2%
2	157	10.6%
3	363	24.4%
4	717	48.2%
5	202	13.6%
Total	**1487***	**100.0%**

* Data was not available for 22 cases

Surgical Pathology

Table II shows the surgical pathology related to the perioperative deaths. Trauma was the most significant pathology related to perioperative deaths and it accounted for 34% of the deaths. Road traffic accidents were responsible for 1204 (79.4%) of the trauma deaths, others causes included falls, assaults and industrial accidents. Neuro-trauma was the principle injury sustained and it contributed to 249 (48.2%) of the deaths due to trauma. Polytrauma occurred in 29.2% of the trauma fatalities and the injuries included limb fractures, rupture of the liver, pelvic fractures and chest injuries. Most of the patients who died from trauma were young, and the age groups of 20 to 39 years accounted for 41.8% of the total deaths. Delay in referrals, delay in inter-hospital transfers, missed initial diagnosis and inappropriate resuscitation were common deficiencies identified in the analysis of the trauma deaths.

Colo-rectal disease was the second important diagnosis of perioperative mortality. The majority of patients presented with obstruction or perforation. Patients presented late, often with feceal peritonitis and advanced sepsis. In contrast to deaths after trauma, patients with colo-rectal pathology were of an older age group, 46.6% were 60 years and above and many of them had coexisting medical illness. Table III shows the pathology associated with colo-rectal disease.

Table II: Surgical Pathology Related to Deaths

Diagnostic Groups	Frequency	Percentage
All Trauma	517	34.0
Colo-Rectal Diseases	176	11.6
Pediatric pathology	162	10.7
Gastric and Duodenal Diseases	147	9.7
Limb Sepsis	108	7.1
Obstetric Complications	62	4.1
Urological Diseases	47	3.1
Vascular Aneurysms	43	2.8
Gynaecological pathology	35	2.3
Small Bowel Obstruction	25	1.6
Miscellaneous	197	13.0
Total	**1519**	**100**

Table III: Pathology Associated with Colon and the Rectum

Diagnosis	Frequency	Percentage
Simple Malignancy	45	25.6
Obstructed Malignancy	49	27.8
Perforated Malignancy	46	26.1
Gangrenous bowel	17	9.7
Trauma	12	6.8
Bleeding	7	4.0
Total	176	100

Pediatric conditions ranked as the third commonest diagnosis of perioperative deaths and 44 of the deaths occurred neonates. Congenital malformation was the major cause of death in this age group and the surgical pathology included diaphragmatic hernia, intestinal atresia, exomphalos and gastrochisis and necrotising enterocolitis. In children between the ages of 1 to 12 years, trauma, burns and intra-abdominal sepsis from common surgical pathologies such as appendicitis, intussusceptions and intestinal obstruction accounted for the deaths. Late presentation and delay in diagnosis contributed to the deaths.

The perioperative deaths related to the stomach and duodenum was entirely due to peptic ulcer disease. There were 43 perioperative deaths from bleeding peptic ulcers and another 104 deaths from perforated ulcers. Due to late presentation, the majority of them were critically ill at time of presentation. Age was identified as an important risk factor in surgery for peptic ulcer complications and 61.9% of deaths occurred in patients 60 years and above.

One hundred and eight deaths occurred among patients who underwent surgery for limb ischaemia. Seventy-four of the patients (69%) of them had severe infection of the limbs at time of surgery. Coexisting medical illness and in particular diabetes mellitus and ischaemic heart disease were commonly observed in these patients. A significant number of patients gave history of receiving treatment from traditional healers before admission. Patients delayed their consent for surgery, in particular for amputations and often were very sick at time of surgery.

The study identified obstetric and gynecological conditions as important causes of perioperative mortality. They accounted for 6.4% of the total perioperative deaths. Of the 62 obstetric related deaths, 52 (83.9%) occurred during emergency procedures and 10 (16.1%) during elective procedures. Postpartum hemorrhage, hypertensive disorders in pregnancy and obstetric embolism were the major causes of in this group (Table IV). Among the gynecological conditions, the most common cause of death was advanced ovarian malignancy and sepsis.

Table IV: Causes of Obstetric Deaths

Cause of Death	Frequency	Percentage
Hemorrhage	17	27.4
Severe hypertension/ eclampsia	13	20.9
Obstetric Embolism	11	17.7
Sepsis	7	11.4
Heart Disease	6	9.7
Others	8	12.9
Total	**62**	**100**

Discussion

Malaysia is the second country in the world, after the United Kingdom's Confidential Enquiry into Perioperative Deaths (NCEPOD) to conduct a nation-wide perioperative mortality review [10]. The large database of a nation-wide study not only provides adequate information for auditing; it also affords a unique opportunity to examine the disease pattern associated with perioperative deaths in the country. A major drawback of the POMR was a failure to collect data on the total number of surgeries for each specific procedure. As the denominator was not available, the study was unable to quantify the risk of death for specific conditions. Trauma was identified as the principle diagnosis related to perioperative deaths, accounting for 34% of the perioperative deaths. This is not unexpected as Malaysia has a high rate of road traffic accidents [11,12]. In fact it is the main cause of hospitalization and death among young males in the country [13]. Motorcycles are used as a frequent mode of transport and most deaths and serious injuries are related to them [14]. The deficiencies in the management of trauma observed in this review are similar to that of other audit reports on trauma [15,16,17]. The implementation of pre-hospital care and trauma systems has shown to decrease the incidence of preventable death following injuries [18,19,20]. Such advances in trauma services are not available in Malaysia and are restricted by lack of infrastructures and trained personnel although health care authorities are taking steps to improve in these areas. The thrust of trauma management is on basic principles of trauma, improvement in communications and transport of the critically ill.. As general surgeons play a major role in the trauma management, it may be appropriate to train them to develop expertise in multi-specialty injuries. This approach can reduce the need to depend on specialist trauma surgeons to manage the trauma load in developing countries.

Infective gastrointestinal conditions such as typhoid, amoebiasis and tuberculosis that are known to be common in developing countries were rarely encountered in this review. This can be attributed to the urbanization, a high standard of water supply and sanitation available to more than 90% of the population. In contrast, colorectal malignancy a disease related to Western dietary habits was the commonest intra-abdominal pathology identified. Clinical conditions like complications of peptic ulcer, urological diseases and vascular conditions were also identified as important causes of perioperative deaths. With increasing life expectancy of the population, diseases of advancing age are expected to increase proportionally. Elderly patients have reduced physiological reserves and are at increased operative risk. In an effort to improve the quality of care of the elderly the POMR committee has recommended a multi-disciplinary approach. Better outcomes in surgery for the elderly can be expected if there is a team approach by internists, anesthesiologists and surgeons in optimizing the physical status of the patients before surgery[21]. High dependency units and intensive care facilities are important elements in the care of the elderly and critically ill patients. The MOH has instituted measures to improve and increase these facilities. The numbers of such beds are being increased in stages and in the newer hospitals under construction ample provision for critical care facilities has been made.

The majority of the perioperative deaths in the peadiatric age group were associated with conditions where death was inevitable. However, unfortunately there were deaths that occurred after surgery for common conditions such as appendicitis, intestinal obstruction and intussusceptions. Late presentation and sepsis were the main cause of these deaths.

Although improvement in socioeconomic standards as resulted in decline of maternal mortality rates in the country, most of the traditional causes of death continue to persist. Postpartum hemorrhage continues to be the leading cause of maternal mortality in this country, followed by hypertension, embolism and sepsis. In an independent ongoing National Maternal

Mortality audit, obstetric hemorrhage was the leading cause of death [25]. A review conducted in a major teaching hospital in the country noted that women who were non-booked, aged above 40 years and multiparous were found to be at highest risk of maternal death [26]. Strategies to improve maternal health in the country continue to receive attention.

A significant difference in surgical pathology compared to the West was the late presentation. The surgical emergencies were a few days old at time of presentation was often associated with complications and sepsis. The cancers were in the advanced stage and unsuitable for curative procedures. Patients commonly presented as an emergency. In a survey conducted by the POMR committee it was noted that in Malaysian hospitals, emergency surgery accounted for more then 60% of the total surgical procedures performed [22]. In this review, emergency surgery accounted for 85.6% of the fatalities. This is not a reflection on the lack of access to medical facilities in the country but due to lack of confidence and ignorance of the benefits of modern medicine. Although the country has made rapid economic progress, the cultural barriers and fear for surgery continues to prevail. Traditional treatment is preferentially utilized as it incorporates spiritual elements in the therapy and is non-invasive [27,28,29,30]. It is hoped that the socio-economic progress of the country and health education efforts will influence the societal behavior to have trust in modern health care facilities.

Conclusion

The surgical pathology related to operative deaths in Malaysia are different from other developing and developed countries; while death from trauma and the late presentation of surgical conditions are similar to developing countries, the diseases of the West and their associated problems are beginning to emerge. As the country races towards a developed nation status, increasing life expectancy and changing life-styles are expected to influence the disease pattern. The planning of surgical facilities and manpower development must recognize the changes taking place.

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References

1. Gwatkin DR, Guillot M, Heuveline P. The burden of disease among the global poor. Lancet 1999; 354: 586-89.
2. Macfarlane S, Racelis M, Muli-Musiime F. Public health in developing countries. Lancet 2000; 356: 841-46.
3. McKee M, Jacobson B. Public Health in Europe. Lancet 2000; 356: 665-70.
4. Campling EA, Devlin HB, Hoile RW, Lunn JN. The Report of the National Confidential Enquiry into perioperative Deaths (NCEPOD) 1992/93.

5. Nundy S. Difficulties of surgery in the developing world: a personal view. Lancet 1999 April, 353 Suppl 1: S121.
6. Mukerjee S. Gupta T. Surgery in India. Archives of Surgery. 1997; 132(6): 571-8.
7. Watters DA, Kapitgau WM, Kaminiel P, Liko O, Kevau I, Ollapallil J, Ponifasio P. Surgical capability and surgical pathology in Papua New Guinea in the year 2000. Aust N Z J Surg 2001; 71(5): 274-80.
8. Odero W, Garner P, Zwi A Traffic injuries in developing countries: a comprehensive review of epidemiological studies. Trop Med Int Health. 1997; 2(5): 445-60.
9. A.B.Suleiman, M.S.Lye, A.Mathews, J.Ravindran. Advances in Heath in Malaysia. Med. J. Malaysia 1995; 50(Suppl A): S3-10.
10. Campling EA, Devlin HB, Lunn JN. The Report of the National Confidential Enquiry into perioperative Deaths (NCEPOD) 1989, NCEPOD, Royal College of Surgeons of England.
11. Arokiasamy JT, Krishnan R. Some epidemiological aspects and economic costs of injuries in Malaysia. Asia Pac J Public Health 1994; 7(1): 16-20.
12. Quality of Roads in Malaysia - Road Safety, Highway Planning Unit, Ministry of Works Malaysia, Kuala Lumpur, 29 Aug 1998.
13. Ministry of Health, Malaysia. Statistics from the Information and Documentation Unit- 1995.
14. Accident Statistics for 1997 to 1999. Royal Malaysian Police.
15. Davis JW, Hoyt DB, McArdle MS, Mackersie RC, Eastman AB, Virgilio RW, Cooper G, Hammill F, Lynch FP. An analysis of errors causing morbidity and mortality in a trauma system: a guide for quality improvement. J Trauma 1992; 32(5): 660-5.
16. McDermott FT, Cordner SM, Tremayne AB. Management deficiencies and death preventability in 120 Victorian road fatalities (1993-1994)> The Consultative Committee on Road Traffic Fatalities in Victoria. Aust N Z J Surg.1997; 67(9): 611-8.
17. Lau PT, Ong CL, Chan ST. Preventable trauma deaths in Singapore. Aust N Z J Surg.1998; 68(12): 820-5.
18. Nathens AB, Jurkovich GJ, Rivara FP, Maier RV. Effectiveness of state trauma systems in reducing injury-related mortality: a national evaluation. J Trauma 2000; 48(1): 25-30.
19. Mullins RJ, Mann NC Population-based research assessing the effectiveness of trauma systems. J Trauma. 1999; 47(3 Suppl): S67-8.
20. Yates D, Regional trauma systems BMJ 1997; 315: 1321-322.
21. Extremes of Age. The 1999 Report of the National Confidential Enquiry into Perioperative Deaths, London.
22. Perioperative Mortality Review. A two Year Report (July 1994-June 1996) Ministry of Health Malaysia, Published 1998.
23. Perioperative Mortality Review. A two Year Report (July 1996-Dec1997) Ministry of Health Malaysia, Published 1999.
24. The Report on Confidential Enquiries into Maternal Deaths in Malaysia 1991,1992,1993 and 1993, Ministry of Health, Malaysia.
25. Abdullah A, Mahmood JH, Adeeb N. Maternal mortality rate in the Obstetric Unit of University Kebangsaan Malaysia: 1981-1990. J Obstet Gynaecol 1995; 21(3): 299-303.
26. Suleiman AB, Mathews A, Jegasothy R, Ali R, Kandiah N. A strategy for reducing maternal mortality. Bull World Health Organ 1999; 77(2): 190-3.
27. Perioperative Mortality Review. A two Year Report (July 1992-June 1994) Ministry of Health Malaysia, Published 1996.
28. Ariff KM. Preferential utilization of healthcare systems by a Malaysian rural community for the treatment of musculoskeletal injuries. Med J Malaysia 2000; 55(4): 451-8.
29. Ariffin H, Abdullah WA, de Bruyne J, Lee CL, Peng LH. Belief in traditional healers amongst Malaysian parents of children with cancer. J Trop Pediatr 1997; 43(6): 375-6.
30. Rahman MN, McAll G, Chai KG Massage-related perforation of the sigmoid colon in Kelantan. Med J Malaysia 1987; 42(1): 56-7.