

A 5-YEAR EVALUATION OF THE EFFECT OF INTRODUCTION OF SUBSPECIALTY PRACTICES ON SURGICAL CASE LOADS IN THE ORTHOPAEDIC DEPARTMENT OF MOI TEACHING AND REFERRAL HOSPITAL

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ABSTRACT

Background: Subspecialization within the field of orthopaedic surgery is on the increase in the developing world.

Objective: To evaluate the trends in surgical caseloads following introduction of subspecialty practices in the Department of Orthopaedics at Moi Teaching and Referral and Hospital.

Methods: Retrospective review of theatre records of all orthopaedic surgeries between 2011 and 2015 was done. The numbers of surgeries were categorized as either trauma or non-trauma. The trends in surgical case loads were documented and analyzed against the changing number of orthopaedic surgeons, theatre time allocation, number of orthopaedic trainees and the number of hospitals offering consistent orthopaedic care in the catchment area.

Results: Nine thousand and ninety one cases of orthopaedic surgery were performed from 2011 to 2015; of which 9601 (96.1%) were trauma cases while 390 (3.9%) were non-trauma surgeries. Non-trauma surgery caseloads consistently increased over the five year period from 2.5% to 4.8%. The critical factors in increasing orthopaedic surgery caseloads were theatre time allocation and the restructuring of the orthopaedic department into subspecialties.

Conclusion/ Recommendations: Trauma surgeries were predominant during the study period. A restructuring of an orthopaedic department to accommodate subspecialty practices and an increase in the number of surgeons; must be coupled with an increase in theatre allocation time in order to increase orthopaedic non-trauma surgical caseloads.

INTRODUCTION

The concept of subspecialization in orthopaedic surgery was introduced by John Charnley in the 1960s. His focus was on total hip replacement surgery that led to achievement of excellence in surgery for a single part of the body (1). Since then, orthopaedic surgery has undergone tremendous progress. This has been brought about by fragmentation of the discipline into subspecialties. The subspecialty practice is achieved either through fellowship training at institutions structured to provide the necessary expertise to qualify orthopaedic subspecialists or joining a multi-disciplinary specialty group where one can limit their practice to specific surgical procedures (2). Currently, there is an increasing tendency for orthopaedic surgery trainees to complete at least one fellowship program following residency training. Subspecialization is thus at the forefront of research in the development of new modalities for better patient care.

A four year audit loop on thyroid surgery by Agada *et al* (3) suggested that thyroid surgery subspecialization is beneficial as far as overall outcome is concerned. The study revealed that thyroid surgery caseload

had markedly increased, preoperative investigations were reduced and type of surgery standardized. Goodfellow *et al* (4) in their four year study on trends of cholecystectomies done by surgeons with interest in hepatobiliary demonstrated that cholecystectomy caseload increased with subspecialization from 40.4% to 58.5%.

Moi Teaching and Referral Hospital offers the clinical environment for orthopaedic residents from Moi University. The training of orthopaedic surgeons has led to an overall increase in the number of orthopaedic surgeons over the five year period from six to fourteen. With this increase in the number of orthopaedic surgeons, a predominant trauma care pattern at the disadvantage of non-trauma care was noted. Overcrowding at the clinical areas and a lack of subspecialty practice leading to absence of skills for more complex orthopaedic problems also emerged. In view of this, the department of orthopaedics and trauma was restructured in order to address the challenges and to aggressively pursue the introduction of subspecialty practice. All the orthopaedic consultants were tasked with identification of areas of interest and introduction of clinics within those areas. The department was

restructured into: trauma which consisted of two teams with four surgeons in each team, paediatrics and foot (2 surgeons), pelvis and acetabulum (1 surgeon), arthroplasty (1 surgeon) and spine and knee specialty practice (1 surgeon). This was based on the individual surgeon's interests in the specific area as well as post residency training in the subspecialty. Services shifted from a 3 firm to a 5 firm arrangement which led to a decrease in duplication of services. In this review, cases were classified as either being trauma or non-trauma.

MATERIALS AND METHODS

A retrospective evaluation of theatre records of all orthopaedic surgeries done each year between 2011 and 2015 at Moi Teaching and Referral Hospital was done. The number of surgeries done in each specialty were counted and categorized into the four subspecialty areas. The surgical cases done in 2011 were classified according to the category they would fit if they were done post-implementation of subspecialty practice since the subspecialty practices were initiated in January 2012. Paediatric trauma cases and emergency orthopaedic cases were classified and done under the trauma list, reflecting the kind of surgeries that a general orthopaedic surgeon would be expected to perform in our set up. Spine trauma cases and pelvis/acetabulum trauma cases were classified under the spine subspecialty and pelvis/acetabulum specialty, respectively. These were considered cases that needed a specialist to perform. The milieu under which this 5-year period was functioning was evaluated. This included the change in the number of: orthopaedic surgery trainees over the 5 year period, orthopaedic surgeons and their accompanying full-time equivalents, hospitals offering consistent orthopaedic care in the catchment area and theatre time allocation.

RESULTS

A total of 9991 orthopaedic surgeries were performed in the five year period from 2011 to 2015. Out of this, 9601 (96.1%) were trauma cases while 390 (3.9%) were non trauma surgeries. There was a drop in the absolute number of cases between 2011 and 2012. Between 2012-2013 and 2014-2015 there were increases in orthopaedic cases by 8.3% and 34.7% respectively. A paired sample test for the five year period showed

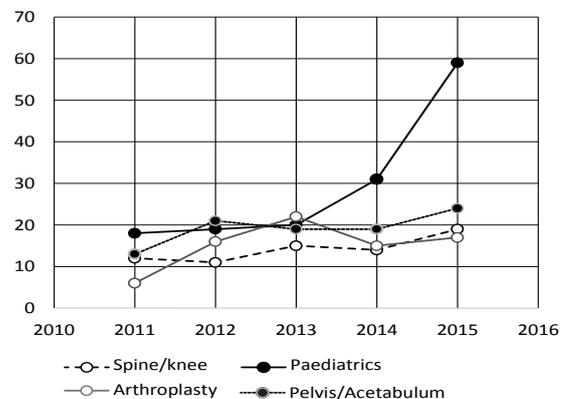
a statistically significant change in the orthopaedic caseloads ($p < 0.0137$) (Table 1).

Table 1
Number of surgeries between January 2011 and December 2015

Year	Trauma	Non-trauma	Total
2011	1888 (97.5%)	49 (2.5%)	1937
2012	1714 (96.2%)	67 (3.8%)	1781
2013	1853 (96.1%)	76 (3.9%)	1929
2014	1772 (95.7%)	79 (4.3%)	1851
2015	2374 (95.2%)	119 (4.8%)	2493
Total	9601 (96.1%)	390 (3.9%)	9991

The overall number of non-trauma surgeries increased in the five year period from 49 (2.5%) to 119 (4.8%). The highest percentage increase in non-trauma surgeries was seen in paediatric orthopaedic cases which increased from 18 (36%) to 59 (49.6%) over the five year period. The increase in number of non-trauma surgeries against the total orthopaedic and trauma caseloads was statistically significant ($p < 0.0016$) (Figure 1).

Figure 1
Trends in non-trauma surgeries between January 2011 and December 2015



Over the 5 year study period, the hospital realized an increase in the number of orthopaedic surgeons from six to fourteen. The number of trainees from Moi University also increased, gradually increasing the total number of work force in the department of orthopaedics and trauma. The full time equivalent of surgeons was calculated based on the assumption that a full time employee works an average of 40 hours per week. The orthopaedic trainees were assumed to be part time employees (50% full time equivalent) since they had to create time for academic activities like lectures and seminar presentations (Table 2).

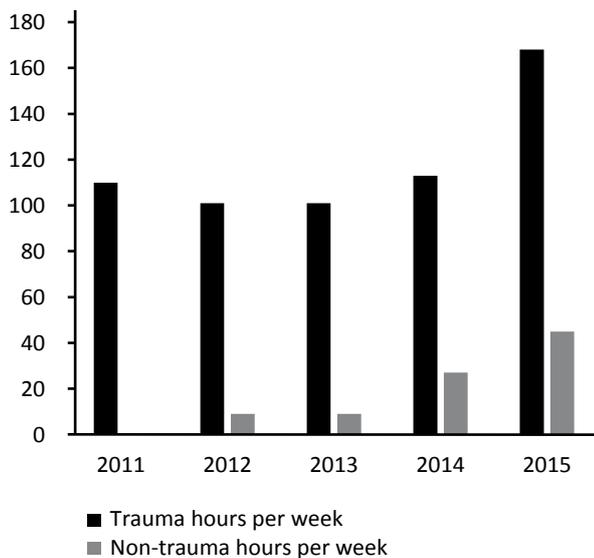
Table 2

Number of surgeons and trainees and their full time equivalents

Year	No. of surgeons	No. of trainees	Full time equivalent
2011	6	12	15
2012	10	10	17
2013	12	12	21
2014	12	16	24
2015	14	25	32

Figure 2

Theatre allocation



The increasing trend in theatre time allocation for non-trauma cases was positively correlated to increasing number of caseloads ($p < 0.012$); while the number of surgeons and the number of hospitals within offering constant orthopaedic care were negatively correlated with the increasing caseloads ($p < 0.056$) at Moi Teaching and Referral Hospital (Figure 2).

DISCUSSION

Globally, trauma remains an important public health problem and contributes significantly to high morbidity, mortality and long term disability. It accounts for more than five million deaths each year representing 10% of the world's deaths (6). In Kenya, despite the attempts to prioritize injury prevention, trauma care systems have not been adequately assessed (7). In spite of the introduction of subspecialty practices in Moi Teaching and Referral Hospital, trauma (representing 96.1% of cases) is still the most common reason for orthopaedic surgery. This is in keeping with the predominance of the burden of trauma in the developing world (8).

Despite the smaller percentage of non-trauma cases as compared to the trauma cases, the increase in non-trauma cases over the five year period was

statistically significant. However, in the initial four years, the total number of cases decreased, suggesting a redistribution effect between the trauma and non-trauma subspecialties. It would have been expected that the number of total cases done at Moi Teaching and Referral Hospital would decrease in response to the increase in other hospitals within the catchment area offering the same care. This was not so; presumably because the number of patients the new facilities serve is insignificant in our set-up to influence this. It is also noteworthy that majority of these hospitals are private hospitals which our clientele would not be able to access due to financial constraints.

In the fifth year, there was a significant increase in the total number of cases; both trauma and non-trauma. This increase was associated significantly with an increase in the number of theatre hours allocated to orthopaedic surgery. This is an interesting finding which suggests that weekly theatre allocation time is of essence when attempts to increase surgical caseloads are made. This would have a ripple effect on the surgical patient waiting times and ease congestion in orthopaedic wards. Certainly, an investment in theatre time must be coupled with an increase in surgeons, other theatre staff, surgical supplies and improved theatre efficiency for the effect to be demonstrable. A restructuring of an orthopaedic department into subspecialties would be necessary to drive an increase in non-trauma caseloads, since trauma is so rampant and would absorb any available theatre space in our developing world set-up.

The main limitation to this review was limited published literature with regard to the impact of introduction of subspecialty orthopaedic practice on surgical caseloads and specific patient outcome. Studies done by Agada *et al* (3) and Goodfellow *et al* (4) were in general surgery specialty with limited information on orthopaedics. This can be mitigated by aggressive research on the specific orthopaedics subspecialty practice and their effect on caseloads as well as patient outcomes. Some factors were difficult to evaluate and quantify such as elective cases deferred due to absence of bed space/operating room time, episodes when the elective/emergency theater was allocated to other surgical teams for more urgent cases and shortages in staffing.

CONCLUSION AND RECOMMENDATIONS

The critical activation factor for the increase in total number of cases over the five year period was the increase in weekly theatre allocation time. The initiator of this trend is the advent of regular, dedicated orthopaedic trauma theatres that allowed timelier and more effective care for the patients.

We recommend that in a bid to increase total surgical caseload in the developing world, the training of surgeons must be coupled with an increase in theatre

allocation time; while an increase in non-trauma caseloads requires a restructuring of orthopaedic surgery departments to accommodate the same.

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