SAJS
Paediatric Surgery

The undergraduate paediatric surgery curriculum in Nigeria – how have we fared?

FRANCIS A. UBA, B.M. CH.B., F.M.C.S., F.W.A.C.S.
Department of Surgery, Jos University Teaching Hospital, Jos, Nigeria

JOHN Y. CHINDA, M.B. B.S., F.W.A.C.S.
Department of Surgery, University of Maiduguri Teaching Hospital, Maiduguri, Nigeria

LUKMAN O. ABDUR-RAHAMAN, M.B. B.S., F.W.C.A.S.
Department of Surgery, University of Ilorin Teaching Hospital, Ilorin, Nigeria

A. MOHAMMAD, M.B. B.S., F.W.A.C.S.
Department of Surgery, Aminu Kano Teaching Hospital/Bayero University, Kano, Nigeria

STELLA C. UBA, R.N., R.M., DIP. (I.C.N.), B.SC., P.G.D.E.
Department of Nursing, Jos University Teaching Hospital

Summary

Background. In the Nigerian setting the curriculum of each medical school is the sole responsibility of the senate of the respective university. This arrangement results in variability in learning objectives and in students' acquisition of skills to manage clinical problems. Educational objectives can be used to both standardise and evaluate curricula. This study aimed to: (*i*) identify main objectives of paediatric surgery at the undergraduate level; (*ii*) establish students' knowledge with regard to these objectives; (*iii*) evaluate the input of both specialists and non-specialists to these objectives; and (*iv*) examine the status of undergraduate paediatric surgery instruction in our medical schools.

Materials and methods. This was a cross-sectional survey of students, teachers and undergraduate deans with regard to undergraduate paediatric surgery teaching. The cognitive and perceived level of knowledge about common paediatric surgical conditions of 4th- and 6th-year medical students in four randomly selected Nigerian universities was surveyed using educational objectives. The same objectives were used to survey 26 paediatric surgeons, 46 senior house officers and 46 general surgeons. Undergraduate paediatric surgery curricula, obtained from the offices of the deans of the four medical schools, were also reviewed. Data were analysed using descriptive methods and one-way analysis of variance (ANOVA).

Results. The 6th-year students' and house officers' perceived knowledge of the objectives was remarkably similar. Overall, students' familiarity scores increased from the 4th to the 6th year ($p<0.05$), but fell short of the expected proficiency levels in the 6th year.

The general surgeons and paediatric surgeons expressed similar expectations. Thirty items on the objectives were considered to be essential (mean score >2.0) and 8 items to be non-essential (mean score <1.5) by paediatric surgeons, whereas the general surgeons regarded 27 items to be essential (mean score >2.0) and 11 to be non-essential (mean score <1.5).

Data from the deans' offices varied, but indicated limited exposure to paediatric surgery in the undergraduate curriculum in 2 (50%) of the 4 institutions.

Conclusion. The study clarified the relationship between the expected and perceived students' knowledge of these objectives, and identified areas requiring specific attention. These results, and perhaps similar ones in future, can be used towards establishing a unified, standardised undergraduate paediatric surgery curriculum.

Undergraduate paediatric surgery poses the challenges of teaching future doctors about surgical procedures in and the care of children, and about the intersection of the two.[1] Formulating an undergraduate paediatric general surgery curriculum that will meet these challenges is not an easy task. Although paediatric surgeons are the authorities on their specialty, input from other physicians regarding specific needs arising from experience in the course of their practice,[2] and from other stakeholders, including students and even the public, may be invaluable in compiling the undergraduate paediatric general surgery curriculum.

The standard method of defining a curriculum through a set of objectives is well documented.[3-7] Many developed countries have defined clearly the contents of their undergraduate paediatric general surgery curricula and the study objectives in paediatric general surgery at the undergraduate level, but in our setting there is a dearth of such information. It is in this context that we undertook a cross-sectional survey of medical students, teachers in general paediatric surgery, and deans of some medical schools in Nigeria. The study aimed to: (*i*) identify the main objectives of paediatric surgery at the undergraduate level; (*ii*) establish the content of students' knowledge with regard to these objectives; (*iii*) evaluate the input of both specialists and non-specialists to these objectives; and (*iv*) examine the status of undergraduate paediatric surgery instruction in our medical schools.

Materials and methods

The study was a cross-sectional survey of teachers, students and undergraduate deans involved in teaching and managing paediatric general surgical problems, using a list of paediatric general surgery undergraduate objectives.[8] Four medical schools were randomly chosen for the study, two each from the northern and southern parts of Nigeria. Other stakeholder groups, such as paediatricians, were deliberately excluded from the study because the survey was limited to cognitive objectives in the surgical faculty.

The cognitive and perceived level of knowledge about common paediatric surgical conditions of a cross-section of 4th- and 6th-year medical students in four randomly selected Nigerian universities was surveyed using existing educational objectives. The same objectives were used to survey 26 paediatric surgeons, 46 senior house officers and 46 general surgeons.

The list of cognitive objectives (Table I) used in this study was compiled from eight sources: (*i*) the list provided by Postuma and the Education Committee of the Canadian Association of Pediatric Surgeons (CAPS);[9] (*ii*) the *Manual of Surgical Objectives* of the Association for Surgical Education (ASE);[10] (*iii*) the *Objectives for the Qualifying Examination* of the Medical Council of Canada;[11] (*iv*) the objectives recommended by Helikson and Wolfson in the chapter on 'Pediatric surgery' in the *Essentials of Surgical Specialties*;[12] and (*v*) the deans' offices of the four medical schools surveyed. The compilation process involved selecting only those objectives found in at least two of the above sources.

TABLE I. LIST OF EXISTING EDUCATIONAL OBJECTIVES

- General
  - Fluid and electrolyte
  - Child abuse
  - Paediatric trauma principles
- Head and neck
  - Branchial cleft anomalies
  - Thyroglossal duct cyst
  - Cervical lymphadenopathy
  - Torticollis
- Thorax
  - Acute respiratory distress
  - Foreign body aspiration/ingestion
  - Epiglottitis
  - Pierre Robin syndrome
  - Tracheo-oesophageal fistula
  - Congenital diaphragmatic hernia
  - Congenital lobar emphysema
  - Congenital cystic lung disease
  - Pulmonary sequestration
  - Bronchiectasis
  - Empyema
  - Spontaneous pneumothorax
  - Vascular rings
- Gastro-intestinal system
  - Acute abdominal pain
  - Gastro-intestinal bleeding
  - Gastro-oesophageal reflux
  - Intestinal obstruction in the newborn
  - Hypertrophic pyloric stenosis
  - Intestinal malrotation/volvulus
  - Meconium ileus
  - Meconium plug syndrome
  - Intestinal duplication
  - Omphalomesenteric duct lesions
  - Meckel's diverticulum
  - Necrotising enterocolitis
  - Intussusception
  - Inflammatory bowel disease
  - Appendicitis
  - Intestinal polyps
  - Hirschsprung's disease
  - Imperforate anus
  - Anorectal conditions
- Liver, spleen and pancreas
  - Obstructive jaundice in the infant
  - Cholelithiasis
  - Biliary atresia
  - Choledochal cyst
  - Portal hypertension
  - Hepatic and splenic trauma
  - Pancreatitis
- Abdominal wall and genito-urinary tract
  - Gastroschisis/omphalocele
  - Umbilical hernia
  - Swellings of the groin and scrotum
  - Undescended testicle
  - Testicular torsion
  - Circumcision
  - Ovarian cysts
  - Haematocolpos
  - Ambiguous genitalia
- Paediatric tumours
  - Haemangioma/lymphangioma
  - Abdominal masses
  - Neuroblastoma
  - Wilms' tumour
  - Teratoma
  - Rhabdomyosarcoma

The learning objectives were incorporated in four different structured questionnaires: one for medical students, one for house officers, one for general surgeons, and one for paediatric surgeons. Each questionnaire included several demographic questions particular to the group targeted, as well as instructions for scoring the familiarity or importance of the items on the objectives list.

The scoring instructions for students were as follows: (*i*) I have never heard of the condition = 0; (*ii*) I have heard of the condition, but am not familiar with it = 1; (*iii*) I can recognise the signs and symptoms of the condition = 2; and (*iv*) I am confident with the diagnosis and initial management of the condition = 3.

The instructions for the doctors were as follows: Undergraduate medical students should: (*i*) not be required to be aware of the condition = 0; (*ii*) be aware of the condition = 1; (*iii*) be able to recognise the signs and symptoms of the condition = 2; (*iv*) be confident with the diagnosis and initial management of the condition = 3.

A different questionnaire, designed only to generate information about instruction in paediatric general surgery in respective schools, was sent to the respective deans of the medical schools; this did not include the learning objectives.

For the doctors, an objective was considered 'non-essential' if the average score was <1.5, 'indeterminate' if it was ≥1.5 but <2.0, and 'essential' if it was ≥2.0. Similarly, for the students the level of knowledge was considered 'inadequate' if the average score was <1.5, 'fair' if it was ≥1.5 but <2.0, and 'adequate' if it was ≥2.0.

Data from the returned questionnaires were collated and analysed on an Excel spreadsheet. Statistical analysis included descriptive methods and one-way analysis of variance (ANOVA); $p<0.05$ was considered significant.

Results

A total of 600 questionnaires (150 in each medical school) were administered to the students, of whom 512 (85.3%) responded, comprising 308 from 4th-year classes (60.2%) and 204 from 6th-year classes (39.8%).

A total of 200 questionnaires were sent to the doctors, of whom 118 (59.0%) responded, comprising 46 senior house officers (39.0%), 26 paediatric surgeons (22.0%), and 46 general surgeons (39.0%). The four undergraduate deans responded to the questionnaires sent to them.

Overall, students' familiarity scores increased from the 4th to the 6th year (Fig. 1). The scores indicated that the 4th-year classes had an inadequate level of knowledge on topics relating to surgery of the paediatric hepatobiliary system, gastro-enterology, the cardiothoracic and head-neck regions, oncology and paediatric surgery in general (mean scores <1.5). Their level of knowledge was fair with regard to the genito-urinary (GU) system and anterior abdominal wall defects (mean scores 1.5). The level of knowledge of the 6th-year class was inadequate with regard to the paediatric hepatobiliary system, the cardiothoracic region and paediatric surgery in general (mean scores <1.5), and their knowledge about the GU system, anterior abdominal wall defects, head and neck and oncology was fair (mean scores ≤1.5). Although the 6th-year class had a correspondingly superior level of knowledge, their knowledge approximated the expected level of proficiency only in paediatric gastro-enterology (mean score >2.0).

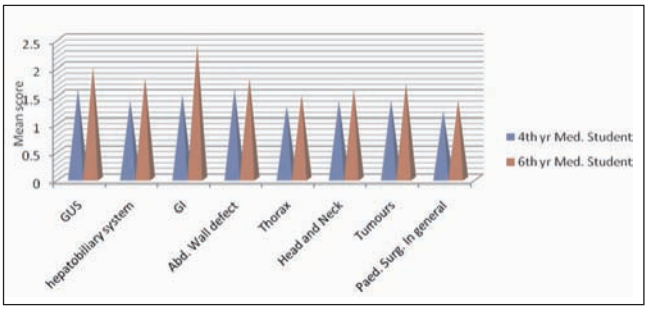

Fig. 1. Comparison of self-assessed cognitive knowledge level of paediatric surgery between 4th- and 6th-year medical students (4th-year v. 6th-year mean score $p>0.05$ for all except gastro-intestinal ($p=0.03$).

On the basis of the definitions and arbitrary cut-offs provided, 16 objectives were considered by all doctors to be non-essential and 38 to be essential (Table II). The listing of educational objectives showed that the senior house officers' expectations of what objective groups should be considered essential in the undergraduate general paediatric surgery curriculum were generally lower than those of the surgeons ($p<0.05$). The general surgeons' and paediatric surgeons' mean scores were dissimilar in most instances (Fig. 2).

Overall the data from the deans' offices showed considerable variations in both number of hours allotted to paediatric instruction and the proportions of clerkship exposure of students between paediatric general surgery and other surgical specialties (Table III). The instruction formats were mainly formal lecturing, teaching and organised tutorials; only one of the schools had a full, functional information and communication technology (ICT) department and medical illustration unit (MITU).

Discussion

Surveys of specialty objectives can be useful in defining educational priorities and identifying areas of proficiency and deficiency. We wish to make it clear that although individual objectives may show specific trends, we grouped them into broad body-area groups for ease of interpretation. The wide variation in mean scores across objectives permitted us to classify several of them as 'essential' as well as to identify several 'non-essentials'.

The study revealed several significant points. First, the students' self-assessed familiarity with the objectives showed a significant rise between the 4th- and the 6th-year classes

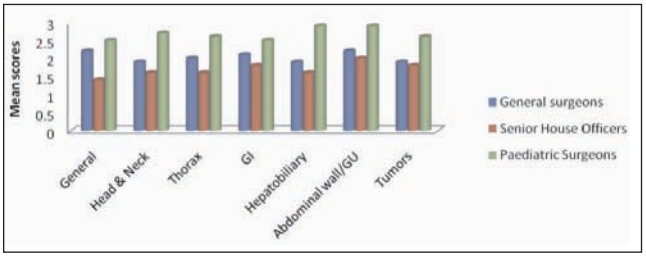

Fig. 2. Comparison between non-specialist and specialist surgeons regarding the areas considered important in the undergraduate paediatric general surgery curriculum. General surgeon v. paediatric surgeon: $p>0.05$ for all except hepatobiliary, head and neck, and abdominal wall defect/genito-urinary ($p<0.05$); general surgeon v. senior house officer: $p>0.05$ for all except paediatric surgery in general ($p<0.05$); senior house officer v. paediatric surgeon: $p<0.05$ for all.

TABLE II. WHAT DOCTORS CONSIDERED ESSENTIAL AND NON-ESSENTIAL IN THE UNDERGRADUATE GENERAL PAEDIATRIC SURGERY CURRICULUM

Essentials	Non-essentials
Paediatric surgery in general	Head and neck
Fluid and electrolytes	Epiglitits/adenoids
Head and neck	Torticolis
Cleft lip/palate	Acute respiratory distress
Branchial duct lesions	Pierre-Robin syndrome
Tongue tie	Thorax
Foreign body ingestion/aspiration	Vascular rings
Cervical lymphadenopathy	Congenital cystic disease of the lung
Thorax	Congenital lobar emphysema
Tracheo-oesophageal fistula	Pulmonary sequestration
Spontaneous pneumothorax	Gastro-intestinal
Gastro-oesophageal reflux	Intestinal duplication
Gastro-intestinal	Intestinal polyps
Hirschsprung's disease	Meckel's diverticulum
Imperforate anus	Inflammatory bowel disease
Malrotation/volvulus	Necrotising enterocolitis
Anorectal conditions (rectal prolapse)	Hepatobiliary
Intussusceptions	Cholecystitis
Neonatal intestinal obstruction	Genito-urinary
Appendicitis	Haematocolpos
Omphalomesenteric duct lesions	Others
Infantile hypertrophic pyloric stenosis	Child abuse
Gastro-intestinal bleeding	
Chronic/acute abdominal pain	
Hepatobiliary	
Neonatal obstructive jaundice	
Choledochal cyst	
Biliary atresia	
Abdominal wall	
Umbilical hernia	
Omphalocele	
Gastroschisis	
Inguinal hernia	
Genito-urinary	
Hypospadias	
Testicular torsion	
Circumcision	
Hydrocele	
Undescended tesis	
Acute scrotal/inguinal swellings	
Tumours	
Abdominal masses	
Others	
Hepatic/splenic trauma	
Head injury	
Spinal bifida	
Paediatric trauma/burns	

in almost all groups, especially the GI group. This probably reflects the impact of the intense revision, including group tutorials, organised to prepare the 6th-years for their final clinical examinations. As was also reported by Poenaru and Woo,[8] the thoracic group in this study did not show a marked variation in familiarity score between the two classes. We agree with Poenaru and Woo[8] that this could have been because the thoracic group may have comprised relatively rare conditions that are infrequently encountered by students.

Secondly, senior house officers' scores fell short of the doctors' expected competency scores, probably because after graduation the young doctors could not retain what had been learnt at medical school. This finding is significant because it is a measure of the adequacy of teaching efforts in the specialty.

TABLE III. EXPOSURE OF MEDICAL STUDENTS TO THE UNDERGRADUATE PAEDIATRIC SURGERY CURRICULUM

Medical school data	4th year	6th year
Average duration of clerkship posting in paediatric surgery	4.2 weeks	4.4 weeks
Mean number of sessions of paediatric surgery instruction within the general surgical clerkship	1.0 weeks	1.2 weeks
Mean number of hours of instruction/week	1.0	1.3
Mean duration of clerkship/theatre rotation	2.1 weeks	2.2 weeks

Thirdly, in contrast to other similar studies[3,6-8] we found a marked dissimilarity between the general surgeons' scores and the paediatric surgeons' scores. This finding is not surprising, since much of the challenge of teaching paediatric surgery at the undergraduate level has to do with the selection of the limited material that must be 'covered' from the wealth of knowledge in the specialty, and this decision has traditionally been made by the paediatric surgical teaching faculty. The paediatric surgeons should therefore be considered the authorities on any individual topic in their specialty. This does not mean that they should monopolise instructional needs within their specialty; they may need the input of other stakeholders, specialists and non-specialists alike, in formulating the curriculum.[2] Our decision to survey graduating medical students and practising senior house officers as well as surgeons was made to ensure varied input within the profession, as suggested by Poenaru and Woo[8] and Lawrence *et al*.[3]

The students' exposure to paediatric surgery varied from school to school. This variability in exposure is a direct consequence of the situation in Nigeria, where the curriculum of each medical school is the sole responsibility of the senate of the respective university.[13] The lack of uniformity in curriculum implementation has some dire consequences, such as impeding successful transfer of students between medical schools and lack of uniform practice among graduates in the country. Although the law empowers the Medical and Dental Council of Nigeria to provide guidelines on the minimum standards of medical education and accredit training institutions at prescribed intervals to ensure the maintenance of such standards,[14] efforts to standardise undergraduate paediatric surgery curricula and evaluate them using educational objectives to improve uniformity of the students' learning will be a step in a right direction.

Although limited by a number of factors, including the regional nature of the survey, the self-report method used and the cognitive objectives tested, this study has several important take-home points.

1. The study has shown both the expected and perceived student mastery of a set of educational objectives, and has identified areas where specific emphasis is required.

2. A revision of objectives based on broad stakeholder input may be necessary to standardise the undergraduate curriculum for paediatric general surgery in our setting.

3. Both specialist surgeons and non-specialist doctors identified similar knowledge objectives for undergraduate paediatric surgery, but graded them differently.

4. Medical students' familiarity with these objectives increased significantly during their clerkship and approached the doctors' expectations, despite the limited and varied exposure to paediatric surgery provided by the medical schools.

We conclude that exposure to paediatric surgery in undergraduate curriculum is limited and varied in our setting. A revision of objectives embracing a broad stakeholder input may be necessary to standardise the undergraduate curriculum for paediatric general surgery. Other similar studies will be necessary to provide a complete and reliable curriculum base for undergraduate pediatric surgery.

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