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Original article

Design and implementation of a training programme for general practitioners in emergency surgery and obstetrics in precarious situations in Ethiopia

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Médecins Sans Frontières (MSF) has been implementing medical assistance programs in Ethiopia since 1994, including the rehabilitation of health structures and the supply of drugs and medical equipment. In 1995, the serious shortage of surgeons in Ethiopia prompted MSF to add a programme to train general practitioners to perform surgery in the Woldya region. The results of the relevant feasibility study were encouraging. The programme's design is based on recent educational data and MSF's experience with introducing transcultural training in countries where unstable conditions prevail. The training programme is currently being studied by the Ethiopian Health Ministry for use as a model for training general practitioners in surgery throughout the country.

Key words: Surgical training — Third world countries — Training and assessing surgical skills

The Ethiopian health system is undergoing restructuring after the country was torn by civil war for more than 15 years (1974–1991). In this country, where there are about 100 surgeons for a population of 56 million people, there is a drastic need for surgical services.[1,2] In 1995, Médecins Sans Frontières (MSF) decided to set up a programme in region 3, a zone of 15 million inhabitants.

A needs analysis clearly shows that general practitioners should be trained in emergency surgical procedures. However, the feasibility of such a programme had to be studied. A number of feasibility conditions

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have to be met;[3] our experience shows that the main ones are: (i) political stability; and (ii) adequate human, material and financial resources.

A team of three surgeon-instructors was selected. Each has extensive experience of surgery in third world countries. This is reflected in their ability to operate on pathologies that have all but disappeared in Western countries (e.g. typhus, peritonitis, uterine ruptures), adjusting to the technical support available. The surgeons are also capable of reviewing the suitability of a given type of surgery in accordance with the technical and human environment. These surgeons have also had teaching experience in similar contexts. Lastly, they are fluent in the teaching language and can make themselves available for sufficiently long training periods.

To enable training to take place in a human and technical environment conducive to learning, MSF rehabilitated operating theatres, provided adequate equipment and, at the same time, gave refresher courses to circulating nurses, scrub nurses, anaesthetists and nurses providing pre- and postoperative care. It is also important to ensure that students will be able to work, in the hospitals to which they are assigned, under the appropriate professional conditions; otherwise they will not work where they are most needed.

Determination and commitment of the Ethiopian health authorities

A training contract setting out the commitments of the parties was drawn up in order to prevent or curb problems. This document will serve as a decision-making aid regarding cancellation of the programme in the event of failure to comply with one or more clauses.

An emergency surgery qualification certificate will be awarded upon completion of this training. The granting of a diploma recognised by the authorities and integrated into the country's educational system is an asset for the sustainability of the project.

Control of student selection

Another precondition for feasibility which needs to be checked is the level of control of student selection by the training organisation. The aim is to prevent favouritism and ensure the ability to recruit those students most likely to complete their training.[3] A selection committee was set up comprising representatives of regional health authorities and of MSF, including one of the surgeon-instructors. The selection test comprised a written examination and an interview to evaluate candidate motivation. Two young doctors were thus selected for the first intake. The total number of students was set at two general practitioner/surgeons per year of training for 2 years. This number was mainly determined by the operating activity expected in Woldya hospital which, after analysis of the registers, showed that it could not accommodate more than two trainees.

Table 1 Modules and their duration

Modules		Duration of teaching (weeks)
M1	Running of the operating theatre/basic skills	2
M2	Minor surgery	4
M3	Anaesthesia/intensive care	2
M4	Gynaecology/obstetrics	8
M5	Traumatology/orthopaedics	9
M6	Abdominal	10
M7	Thoracic	2
M8	Urology	2

Time/duration of training

We empirically assumed a training period of 12 months, which followed the recommendations of the authors of a surgical training programme carried out in Ethiopia in 1991.[4]

The pedagogical content of the training programme

Training is based on the principle of the teaching hospital, where the hospital is the centre of the learning system.[5] Theoretical and practical classes are given in a room in the hospital. Practical application on the patients takes place in the hospital and takes priority over the theoretical aspect. In fact, all care activities are part of the training process and are used by the instructors for teaching purposes. The same demanding level is required of both care and training activities and the courses are given according to a predetermined schedule, although this is adapted to take account of care needs in particular emergencies. Similarly, depending on the pathology present in the hospital, the subject of a class can be modified in order to 'take advantage' of the presence of a prime example corresponding to a part of the programme to be taught. The programme is planned in modules.[6] The modules are planned throughout the year on the basis of prevalence, urgency and gravity.

The first module concerning the working of the operating theatre shows the importance of the immediate physical environment so that the students will be able to assume the role of supervisor/head of department by the end of training. The aim is to take advantage of the first weeks of training to put over two important messages: firstly, the quality of surgical care given to a patient to a large extent depends on the organisation and quality of the medical and nursing care before and after the operation. Secondly, human and material management of the surgery units is fundamental and is one of the responsibilities of the general practitioner/surgeon.

Table 2 Traumatology/orthopaedic surgery module (M5)

(A) Learning objectives

At the end of the module, the trainee will be able to diagnose and treat* or diagnose and refer as follows.
**As a general rule*: (i) to give immediate care to a polytraumatised patient with due regard to priorities; (ii) to manipulate under anaesthesia, reduce and immobilise fractures and dislocations, applying the basic principles of treatment without harming the patient; and (iii) to perform major amputations (upper and lower limb: above and below the knee), and to perform minor amputations (finger and toe amputations). *Regarding physiotherapy*: (i) to prevent postoperative immobilisation complications, i.e. joint stiffness and muscle wasting; and (ii) prescribe active physiotherapy exercises to restore the limb function after immobilisation.

1. Sprains		
1.1	Wrist	Bandage or plaster cast splint
1.2	Knees	Circular plaster cast
1.3	Ankle	Strapping or plaster cast boot
2. Dislocations		
2.1	Shoulder (anterior)	Reduction; Mayo clinic
2.2	Elbow (posterior) and pulled elbow	Reduction; Mayo clinic
2.3	Hip (posterior)	Reduction, skin traction.
2.4	Patella	Reduction, plaster cylinder
2.5	Jaw	Reduction
2.6	Irreducible dislocation	Referral
3. Closed fractures		
3.1	Clavicle	Figure of 8 bandage
3.2	Humeral diaphysis	Reduction, hanging plaster cast
3.3	Forearm bones and distal epiphysis of the radius	Reduction, splinted POP cast
3.4	Metacarpal and phalanges	Reduction, ball of plaster cast, garter splint
3.5	Femoral diaphysis	Transtibial or supra condylar traction
3.6	Neck of femur	Immobilisation in abduction, boot of derotation, or skin traction
3.7	Patella	Posterior plaster slab and referral
3.8	Tibia/fibula	Reduction, long leg walking plaster cast or transcalcaneal traction
3.9	Ankle	Plaster cast boot
3.10	Metatarsus and calcaneus	Plaster cast boot
4. Compound fractures		Debridement and immobilisation Antibiotics (Amputation)
5. Children's fractures		
5.1	Greenstick and epiphysis fractures	Plaster cast or splint
5.2	Clavicle fracture	Sling
5.3	Fracture of the 2 bones of the fore-arm	Plaster cast
5.4	Supracondylar fracture of the elbow	Urgent reduction, immobilise in hyperpronation and flexion
5.5	Femur fracture	Gallows traction
5.6	Tibial fracture	Reduction; long leg walking cast
6. Head injuries		Observation, ± antibiotics
7. Spinal trauma (including neurological and urological complications)		Conservative management Minerva plaster jacket Physiotherapy
8. Pelvic fractures (including urethral injuries)		Conservative management Suprapubic catheterisation Referral
9. Osteomyelitis (septic and tuberculous)		Drilling if acute, antibiotics, immobilisation Referral if chronic
10. Septic arthritis and tuberculous arthritis		Aspiration, washout, antibiotics, immobilisation Referral
11. Joint, nerve, artery and tendon injuries (including gangrene)		
11.1	Joints wounds	Debridement, cleaning, partial suture of the capsule, antibiotics, immobilisation
11.2	Nerve injuries	Wound toilet, debridement, primary suture, immobilisation
11.3	Arterial injury	Ligature
11.4	Gangrene	Amputation
11.5	Rupture of Achilles' tendon	Suture, immobilisation in equinus position
11.6	Injury of finger flexor tendon	Suture, immobilisation, referral if in 'no man's land'
11.7	Injury of flexor tendon at the wrist	Suture immobilisation, referral
11.8	Injury of extensor tendon	Suture, immobilisation
12. Serious hand infections Web space infection, palmar space abscess, flexor tendon sheath infection		Incision, antibiotics
13. Clubfoot (tallipes pedis)		Serial plaster casts

Table 2 Traumatology/orthopaedic surgery module (M5)

(B) Theoretical lessons/tutorials and technical-skills laboratories/in training skills practice

Theoretical lessons/tutorials	Time	Technical-skills laboratories/in training skills practice	Time
Trauma and polytrauma/ triage		Sling/figure of an 8 strapping/bandage	
Introduction to closed fractures/ general method for immobilisation		Ball of plaster cast/finger splint/short and long arm cast	
Upper limb fractures		Ankle strapping/plaster cylinder/posterior plaster slab	
Inferior limb fractures		Skin traction/tibial traction/calcaneal traction/ short and long leg cast	
Sprains			
Dislocations		Plaster casts for children/gallows traction	
Compound fractures		Moving a patient/collar/plaster cuirass	
Amputation			
Children's fractures			
Head injuries			
Spinal trauma/pelvis trauma			
Osteitis/osteomyelitis			
Septic tuberculous arthritis			
Joint, nerve, vessel and tendon injuries			
Serious hand infection			
Physiotherapy			
	Total time		Total time

The second module is devoted to minor surgery, which represents about 50% of the activities of rural hospitals. The length of the modules (Table 1) varies according to the objectives defined. It can range from 2 weeks to 2 months. The definition of the teaching objectives depends on the prevalence of the pathologies encountered, the technical level of the hospital in which the general practitioner/surgeon is to work, the difficulty/ease of intervention and the possibility of referring the patient to a more specialised care centre (Table 2). In the surgical training field, the wording of the objective will include what is expected of the professional in terms of diagnostic and the follow-up to be given (choice of type of surgery). For this training programme, defining the objectives and choice of surgery were covered in a preparatory working seminar (consensus meeting) by a number of surgeons with experience in countries where unstable conditions prevail, including surgeon-instructors and surgeons who had already worked in the teaching hospital in Woldya. The teaching/learning techniques are based on the most widely accepted theories of motor-skills learning[7] including neuropsychology, which emphasises the processing and organisation of perceptual information.[8,9]

During the surgical technique classes, and before entering the operating theatre, the student is required to prepare mentally for the operations, by using imagery and mental practice. The imagery technique consists of describing and drawing the visible and hidden anatomical structures at a given step in the surgical procedure. The mental practice is a more dynamic technique which consists of describing the operating sequence (both the physical medium and the movement to be carried out). During the operation, the instructor checks that the student recognises the visible and hidden anatomical structures and that the movements made are both relevant and safe. After the operation, an interview between the student and the instructor will allow self-evaluation of his actions by the student, with analysis by the instructor.

A continuous student evaluation system is included in the theoretical and practical programmes. In order to evaluate their theoretical knowledge, the students are required to validate each module as the programme progresses. In addition, to ensure currency, an evaluation concerning several modules is carried out every 4 months. To validate theoretical instruction, the acceptable performance level is set at 70% of the total.[10] Each of the eight modules represents 5% of the total mark (module evaluations, therefore, count for 40%) and each of the 4-monthly evaluations counts for 20%, or 60% of the total mark. This system has a dual purpose: firstly, to ensure that modules with a small number of objectives (such as urology) are not ignored; and secondly to attach greater importance (through the 4-monthly evaluations) to modules such as obstetrics/gynaecology or traumatology.

Surgical operations are evaluated as knowledge is acquired, beginning when the student becomes the actual surgeon. This means that the certifying evaluation of each operation is preceded by a formative evaluation period enabling the student to reach a level which the instructor feels to be acceptable for him to be left in charge of the operation, although under his own supervision.

Surgical procedures, trainees follow-up

Name : Dr ..... **Date** :.....

List A (all procedures to be performed satisfactorily)

1) Incision and drainage of abscess	☐☐☐☐☐
2) Stitching of simple cut wound or surgical wound	☐☐☐☐☐
3) Excision of lipomas / sebaceous cysts / small lumps	☐☐☐☐☐
4) Manual reduction of paraphimosis	☐
5) Circumcision for adults	☐☐☐☐
5 bis) Circumcision for new born	☐
6) Removal of foreign bodies from the ear	☐☐
7) Removal of foreign bodies from the nose	☐☐
8) Debridement of war injuries	☐☐
9) Cleaning and dressing of severe burns	☐☐☐
10) Pinch skin graft	☐☐
11) Split skin graft	☐☐
12) Dental extraction	☐☐☐☐☐
13) Normal delivery (stages 2 and 3 of labour)	☐
14) Breech delivery (stages 2 and 3 of labour)	☐☐
15) Episiotomy + suture	☐☐☐
16) Artificial rupture of membranes	☐
17) Vacuum extraction	☐☐☐☐
18) Manual removal of placenta	☐☐☐
19) Lower segment caesarean section*	☐☐☐☐☐☐☐☐☐☐
20) Suture of ruptured uterus*	☐☐
21) Suture of tears of the birth canal (1st or 2nd degree)	☐☐☐
22) Embryotomy / craniotomy / decapitation	☐☐
23) Dilatation and curettage or evacuation and curettage	☐☐☐☐☐
24) Reduction / immobilisation of fractures	☐☐☐☐☐
25) Reduction / immobilisation of dislocations	☐☐☐
26) Cleaning and immobilisation of compound fracture	☐☐☐☐☐
27) Skeletal tractions (transtibial, transcalcaneal or supra condylar)	☐☐☐
28) Major amputations (upper & lower limbs)*	☐☐☐☐
29) Minor amputations (fingers and toes)*	☐☐
30) Aspiration of septic arthritis	☐
31) Laparotomies for peritonitis*	☐☐☐
32) Appendicectomy*	☐
33) Suture of perforated peptic ulcer / or suture of traumatic rupture of the small bowel / or suture of typhoid perforation*	☐
34) Endorectal detorsion of sigmoid volvulus	☐
35) Intra-abdominal detorsion of sigmoid volvulus*	☐☐
36) Resection of sigmoid*	☐☐☐
37) Colostomy (of any type)*	☐☐☐
38) Repair of umbilical / epigastric hernia*	☐☐
39) Chest drain insertion	☐☐
40) Suprapubic bladder puncture	☐☐☐
41) Exploration of scrotal contents (suspected torsion) / or cure of hydrocele*	☐☐☐

Figure 1 (A) Surgical procedures, trainees follow-up record card, List A

The most frequent operations, given the local epidemiology, are validated between one and ten times each before they can be considered as fully mastered. The figure for each operation, therefore, takes account of the experience of the surgeon-instructors and the local recruitment possibilities. For less frequent operations, the students will be required to validate 10 operational procedures from a list of 17, at least once (Fig. 1A and B).

It is hard to evaluate all the skills expected over a year and this is why we used the skills transfer principle.[11,12] This principle consists of identifying the operating procedures taught for a given pathological situation and which are applicable to other pathological situations. For example, the technique involved in suturing a perforated peptic ulcer is similar to that used in suturing a traumatic rupture of the small intestine. Validation of one implies validation of the other.

As regards the evaluation instruments, there is on the one hand an evaluation of complex procedures via a criteria-based observation chart (Fig. 2) and, on the

List B (4 of them to be performed satisfactorily at least once)

1) Marsupialization for Bartholin cyst or abcess	❑
2) Manual reduction of rectal prolapse	❑
3) Culdocentesis (aspiration of Douglas pouch)	❑
4) Subtotal hysterectomy*	❑
5) Salpingectomy*	❑
6) Suture of cervical tear	❑
7) Tubal ligation*	❑
8) Suture of tendons	❑
9) Management of serious hand infection (flexor tendon sheath infection / web space infection / palmar space abscess)	❑
10) Splenectomy*	❑
11) Small bowel resection and anastomosis*	❑
12) Simple Bassini repair of inguinal hernia (not strangulated)*	❑
13) Repair of strangulated inguinal hernia (with or without bowel resection)*	❑
14) Suture of a ruptured bladder*	❑
15) Suture of burst abdomen*	❑
16) Tracheostomy*	❑
17) Cystostomy*	❑

* Evaluation of the procedure performed with the comprehensive "surgical evaluation form".

Anaesthesia

Spinal anaesthesia	❑❑❑❑❑❑❑❑❑
IV ketamine anaesthesia	❑❑❑❑❑❑❑❑❑❑❑❑❑❑❑❑❑
IM ketamine anaesthesia	❑❑❑❑❑❑❑❑❑❑❑❑❑❑❑

Figure 1 (B) Surgical procedures, trainees follow-up record card, List B

other, an evaluation of simple operations by procedural observation charts.

Discussion on implementing the training programme

Various difficulties were encountered in implementing the programme. One of the first difficulties was for the surgeon-instructors to reach agreement on the training objectives, in particular the choice of operations in relation to a given indication, the surgical equipment to be used and what should be handled by the student and what should be referred to a higher authority.

This initial observation falls into a second more general category, concerning the lack of any real pedagogical training on the part of the surgeon-instructors. In our opinion, this lack means that empirical training methods are reverted to (mainly buddy system in the operating theatre plus lectures) as soon as problems are encountered with the more innovative techniques. These empirical training methods have proven to be effective for long duration training programmes. However, they are unable to deal with the training constraints of such an precarious situation. Because of the various constraints (time, budget, human resources) it is necessary to use training methods which enhance and optimise learning.

Another problem lies in the training context:

1. *The need to train doctors in certain surgical practices in just a short period of time.* For the teachers, this implies intensive work in planning, organising and preparing the courses, plus theoretical and practical evaluations. In fact, the time constraints more than ever require that any care situation be transformed into a learning situation.

2. *Random recruitment of patients*: either not enough of them owing to accessibility problems, or insufficiency in terms of the pathologies encountered, given the module teaching needs. This latter point underlines the difficulty involved in reconciling pedagogical planning and its permanent adaptation.

3. *The students' morale*: which is sometimes low (workload, work and living conditions in the hospital, absence of recognition by the rest of the hospital staff), perturbs their progress.

Finally, the last observation is linked to the problems with having the administrative authorities meet their commitments, be they the material conditions offered to the students (salary, housing) or subsequent recognition of the newly acquired skills. Considerable communication and negotiation work is required and should not be under-estimated, from both the quality viewpoint and the time that needs to be devoted to it.

Conclusion

There is no doubt that there is considerable need to train doctors in surgical techniques in the Woldya

COMPREHENSIVE SURGICAL EVALUATION FORM

Operator's name:.....**Trainer's name:** .....

Date :.....**Elective / Urgent**.....

Final diagnosis : .....**Operation :**.....

Total rating ...../100 **(or 103, including technical rating** ...../60) **ALP = 75 %**

I PRE-OPERATIVE PERIOD: ...../12

1. Correlation between the diagnosis and the patient's symptoms

Incorrect diagnosis	Correct diagnosis
−3	+3

2. Relevance of the operating indication

Irrelevant	Relevant
0	+5

3. Pre-operative prescriptions (special investigations, treatment)

Inadequate with vital risk	Adequate but incomplete	Adequate and complete
E	+1	+4

II PREPARATION OF THE OPERATION : ...../16

A . ABILITY TO DESCRIBE THE OPERATING TECHNIQUE

Mistake or omission with major risk	Mistake or omission w/out major risk	Error - free description
−2	+1	+3

B .PATIENT'S PREPARATION

1) Check of patient's identity, operation, side to be operated on and consent

Incomplete check	Full check
−2	+2

2) Preparation check (infusion, shaving, catheterisation ...) **and patient's position**

Incomplete check	Full check
−2	+2

C . CHECK OF THE EQUIPMENT (specific set and equipment for the operation)

Incomplete check	Full check
0	+2

D . OPERATOR'S PREPARATION

1) Dress : pyjamas, shoes (or shoe covers), cap and mask properly worn, cleanliness of the outfit

Unsatisfactory outfit	Satisfactory outfit
0	+2

2) Scrub up : use of sterile brushes, scrubbing time (3 min), putting on the gown respecting the rules of asepsis, gloving

Mistake or omission with major risk	Entirely correct
−2	+2

E . PREPARATION OF THE OPERATING FIELD

Skin preparation, draping according to the operation, respecting the rules of asepsis

Incorrect with major risk	Incorrect without major risk	Correct
−2	+1	+2

F . INSTRUMENTS

Verification of the choice of instruments and lay out on the table, check diathermy, suction, swab count for cavity surgery

Incomplete	Complete
0	+2

III. OPERATING TECHNIQUE ...../60

1) Choice of the surgical approach (incision site)

Inappropriate	Debatable	Appropriate
−2	+1	+2

2) Completing incision

Incorrect	Correct
−3	+4

Figure 2 Comprehensive surgical evaluation form (page 1)

3) Exposure

Poor exposure –3	Good exposure +5

4) Intraoperative diagnosis

Fails to recognise the lesions at all –2	Recognises the lesions but doesn't make etiological diagnosis +1	Recognises the lesions and make proper etiological diagnosis +3

5) Identification of visible anatomical structures

No identification –3	Good identification +3

6) Identification of non visible anatomical structures

No identification –3	Good identification +4

7) Chronology

Poor –2	Good +3

8) Appropriateness of technique (safety of dissections)

Inappropriate technique E	Mistake or omission w/out major risk +4	Appropriate +7

9) Precision

Poor and dangerous E	Not good but not dangerous +2	Good +5

10) Selection of the instruments

Inadequate –3	Debatable +1	Perfect +2

11) Safe and gentle handling of tissues

Poor –3	Poor w/out major risk 0	Perfect +4

12) Haemostasis

Insufficient with major risk E	Insufficient w/hout major risk +1	Sufficient with proper technique +5

13) Suture materials : appropriate for the tissues (thread thickness, quality, absorbability)

Inadequate with major risk –3	Inadequate without major risk +1	Adequate +3

14) Asepsis

No respect for rules of asepsis –3	Mistakes not taken into account –2	Mistakes taken into account + 2	Full respect for the rules of asepsis +4

15) Drainage (decision to drain, choice and position of the drain)

Inadequate –2	Adequate +2

16) Closure : type of suture (continuous, interrupted) appropriate for the tissue, swab count, tightness.

Mistake or omission with major risk –4	Mistake without major risk +2	Good closure +4

IV POSTOPERATIVE PERIOD :...../12

1) Surgical report : clear and sufficient content

No report –2	Incomplete report +1	Full report +3

2) Postoperative prescriptions : vital signs, medication, blood etc.

Inadequate (vital risk) E	No prescription (no vital risk) –1	Incomplete but correct +2	Correct and complete +5

3) Immediate postoperative directions : dressing, drain, sutures, catheter, feeding, positioning of the patient...

Harmful –3	No directions –1	Incomplete but correct +2	Complete and correct +4

V DECISION MAKING IN CASE OF UNEXPECTED SITUATION :...../3

Pre/ Intra / postoperative (do not mark if no unexpected situation)

No decision taken –1	Inappropriate decision 0	Slow but appropriate decision +1	Appropriate decision taken rapidly +3

COMMENTS:

Figure 2 (continued) Comprehensive surgical evaluation form (page 2)

region (Ethiopia). Nevertheless, despite the favourable feasibility of implementing such a training programme and a suitable calendar adapted to the context in the country, various difficulties have arisen. Given that local conditions (socio-economic, long-term interest of concerned partners) are still uncertain and uncontrollable, the success of such a programme lies also in the pedagogical competence of the instructors. The core quality of the surgeon instructors as trainers is the ability to transfer relevant, secure and useful competencies. This training programme is part of a global medical programme including the rehabilitation of health structures and the supply of drugs and medical material. The first training programme for general practitioners in emergency surgery and obstetrics has been completed. An evaluation of their professional activities is foreseen in the near future. Following the results of this evaluation the course can be readapted, if necessary, when the Ethiopian authorities take over.

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