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REVIEW

Improving postoperative care: the role of the surgeon in the high dependency unit

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It has long been recognised that patients have individual clinical needs, and in particular that surgical patients require different levels of care through the course of their treatment. Before the establishment of specialist units to look after dependent surgical patients, it was common practice on a 'Nightingale' ward to position the ill patients nearest the nurses' station. Understanding of patient requirements after major surgery is the basis of progressive patient care, with the most heavily dependent patients consuming the most resources *(1)*. The past 20 years has seen the development of intensive therapy units to care for the critically ill, but the problem of providing appropriate care for the intermediate surgical patient remains largely unaddressed *(2)*. Failure to optimise the care of patients after surgical treatment may threaten the outcome of complex surgical procedures, to the detriment of the patient and the success of the surgical technique.

The argument for improving patient care

The delivery of postoperative care has been the subject of study and concern on both sides of the Atlantic *(3–6)*. Intensive therapy unit (ITU) availability is less in the United Kingdom than that of our European neighbours and, furthermore, the delivery of such care is a subject plagued by politics. What has become apparent both in the UK and the USA is that in an environment of limited funding we must be able to justify the way in which we use intensive care facilities *(3–5,7)*. We must question the logic of developing a two-tier system of care based on wards and ITU, when this fails to consider the middle ground. Attention must now be turned to those patients whose clinical needs do not necessitate the full intervention available on an ITU, but who do require a level of monitoring and care that would be inappropriate on a normal ward *(3,4,8)*. This recognition has led to the development of intermediate care/high dependency units (HDU). While these units have applications within other medical specialties, they are of particular interest to surgeons. Several studies now indicate that the HDU is of most use to the postoperative patient *(7–9)*.

Questions concerning the adequacy of postoperative care in the UK have been raised by recent publications. The NCEPOD report of 1991/1992 looked at 1616 postoperative deaths *(10)*. Of these, 985 occurred on normal surgical wards, 414 on ITU, and 44 on HDU. Of these deaths, 70% were in patients assigned an ASA score of 3 or above, but despite this 1001 of these high-risk patients were returned to the ward after operation. It must be asked whether any of the deaths could have been avoided if higher dependency care had been available. Gamil and Fanning *(11)* looked at the incidence of complications in postoperative patients. Of the patients in their study, 26% were identified as having undergone major surgery and 15% of these were unstable within the first 24 h of operation; 21% of these patients subsequently died or were discharged with severe disability. The conclusion was that certain operations would benefit from additional nursing and medical resources, specifically arterial surgery, trauma, emergency laparotomy, fractured neck of femur and major urological procedures. The study suggested that 17% of the recorded deaths may have been avoided if HDU care had been available and the authors recommended that special postoperative facilities should be available after major surgery. Crosby and Rees *(5)* made a similar observation and concluded that those patients suitable for HDU are admitted either to the ITU or remain at risk on a general ward.

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Rationalising use of intensive care facilities

The inappropriate use of intensive care units has received much attention, particularly in the USA where fear of litigation strikes a fine balance with cost restrictions *(3)*. Nelson *(3)* reported a 10-year retrospective survey of patients admitted to a surgical ITU, concluding that 32% of admissions were inappropriate and could have been managed safely in an area of increased nursing observation. In 1979, Knaus *et al. (12)* reported that 49% of admissions to the ITU at the George Washington University Medical Center were for close nursing observation, not intensive treatment. Kilpatrick *et al. (13)* studied admissions to a general ITU and discovered that 40% of patients were admitted with a predicted risk of mortality of less than 10% using the APACHE score. They suggest that patients with a low mortality risk might be better managed on a high dependency unit. Byrick *et al. (14)* reported that after closure of an intermediate care unit, ITU admissions increased. Another report states that 21% of admissions to a military ITU never actually required the facilities of the ITU *(15)*. Wagner *et al. (4)* studied patients admitted to ITU in 13 tertiary care institutions and scored patients based on severity of illness and type of operation. They concluded that 70% of these ITU admissions had a predicted risk of less than 10% of needing intensive therapy. Furthermore, only 4.3% of these low-risk patients actually received active treatment. Henning *et al. (16)* report that 30% of admissions to a surgical ITU received no active intervention. It seems, therefore, that there is a wealth of evidence of the use of ITU for patients not requiring such complex facilities.

The high dependency unit

The recognition that provision of care based on intensive therapy units and wards alone fails to meet the requirements of a significant proportion of surgical patients has led to the development of the high dependency unit (HDU). The Association of Anaesthetists of Great Britain and Ireland define a HDU as "an area for patients who require more intensive observation, treatment and nursing care than can be provided on a general ward. It would not normally accept patients requiring mechanical ventilation, but could manage those receiving invasive monitoring" *(2)*. Similarly, Crosby and Rees *(5)* describe a high dependency unit as "an area where patients are continuously monitored, and appropriately trained nurses are constantly present". Crosby *et al. (7)* suggest that the nurse : patient ratio should be higher than that found on a general ward, and that the HDU should act "as a staging post within a progressive patient care system which is needed for those patients who do not need the comprehensive services of an ITU, but who do need more care and observation than that available on a general ward".

What therefore are the benefits of operating a high dependency area? From the published data, it can be suggested that availability of an HDU will optimise patient care by:

1 Maintaining the quality of critical care *(4)*;
2 Protecting ITU beds for those who need them *(3)*;
3 Improving the care of patients otherwise treated on general wards *(7)*;
4 Improving postoperative pain relief *(7)*.
5 Allowing a more cost-effective use of available resources.

The situation in the UK

There is limited provision of high dependency care in the UK. A study in 1988 from the Association of Anaesthetists of Great Britain and Ireland identified only 55 hospitals with designated high dependency units *(17)*. An updated study in 1992/1993 identified only 39 hospitals with HDUs *(18)*. These 39 hospitals have since been followed up with the finding that a further six HDUs have closed, and the remaining 33 hospitals having a total of 37 high dependency units (unpublished data). In these hospitals, 88% of HDUs were geographically distinct from the ITU, and 39% were part of an acute general ward. Only 64% of these units were fully open with adequate staffing. The shortfall in HDU provision has again been highlighted by the NCEPOD report for 1992/1993. Based on questionnaires concerning 3081 perioperative deaths, it is reported that HDU facilities existed in only 21.6% of the hospitals studied *(19)*. Similarly, in a study on the provision of intensive care services in England, commissioned by the Department of Health, it is reported that only 20% of hospitals with ITU facilities have functional HDUs, 34 in total *(20)*.

Characteristics of high dependency care in the UK

Houghton *et al. (8)* describe their experience of setting up an ITU in Wrexham. Their unit admitted patients for both intensive and high dependency care. They report that in 1980–1981 no medical patients were admitted to the ITU for high dependency care. Surgical high dependency patients comprised 39.9% of all admissions. They recorded a 0% mortality for high dependency patients. In 1994 Nehra *et al. (9)* reassessed the same unit. In their paper they define their high dependency care patients as those who are either elderly, or who are of ASA categories 1–3 undergoing major surgery. They also included patients who had undergone intermediate/major surgery in ASA categories 3–4 and who did not need any formal organ support. They reported an increase in the use of high dependency beds, with admissions rising from 39% to 50%. High dependency mortality was 0.96%. Of postoperative admissions, 74.7% were elective, with an overall mortality of 1.1% compared with 11.1% for non-elective admissions.

Crosby *et al. (5)* assessed the use of HDU by surgical specialties, finding that 6.5% of cases were general surgical, and 11.6% orthopaedic and trauma and that

Table I. Patterns of admission to three high dependency units

	Crosby et al. (7)	*Coggins R and de Cossart L (previously unpublished data)*				*Nehra et al. (9)*
Type of surgery	*Cardiff 1988/1989* %	*Chester 1991/1992* %	*Chester 1992/1993* %	*Chester 1993/1994* %	*Chester 1994/1995* %	*Wrexham 1991* %
Vascular	28.8	16.1	16.8	18.1	23.8	8
Upper GI	14.7	12.7	14.1	12.9	14.7	19
Colorectal	21.3	34.8	36.3	31.1	29.8	29
Hepatobiliary/ pancreatic	13.6	9.6	8.3	7.3	7.7	6
Orthopaedic/ trauma	3.9	12	12	0.9	10.3	
Other	17.7	14.8	12.5	29.7	13.7	
Total numbers	611	520	590	559	571	249

54% of high dependency admissions were step-down from ITU.

At the Countess of Chester NHS Trust a six-bed surgical high dependency unit has been in place since 1985. The HDU is run independently of the ITU by the surgical team. The nursing staff are highly skilled, and are allocated to work on the HDU only. Nurse : patient ratios, viewed as whole time equivalents (WTE), are higher on the HDU than on the general wards (2.1 WTE/bed, 0.7 WTE/bed, respectively). Accurate audit data is available from 1991, and comparison of the case mix admitted to this unit with the Wrexham and Cardiff data is shown in Table I. In Chester, 7.3% of the total surgical throughput between 1991 and 1995 were thought to require HDU care. On average, 70% of patients are admitted for postoperative care, but only 7% step-down from ITU. The majority of these step-down patients (75%) are postoperative. This difference indicates a more positive primary use of HDU after surgery in Chester compared with Cardiff *(5)*. Between 1991 and 1995 transfer of patients from HDU to ITU has fallen from 6.9% to 3.0%. HDU mortality has risen from 0.8% to 2.9% during the same period, but this probably reflects changing patterns of admission to the HDU. There has been an increase in the proportion of patients undergoing major surgery, particularly vascular surgery. Activity on the ITU in Chester during this period has remained unchanged. Surgical patients continue to comprise 45% of all ITU admissions, despite an overall increase in major surgery performed in Chester. It is doubtful that this increased workload could have been achieved had the HDU not been available.

Identification of patients for HDU care varies between units and mainly follows local practice. ASA score, age and pre-existing disease all play a part *(21)*, but it is most likely that the type of operation performed is the major selection criteria. The risk scoring methods of APACHE II *(22)* and MPM *(23)* are reliable in the ITU but are not appropriate for HDU. POSSUM scores are a very useful indication of operative morbidity and mortality and may well be a better choice in the HDU *(24)*. However, it does not address the problem of assessment of surgical patients who do not require surgery. There needs to be a consensus on the selection of patients for this facility to allow comparison of the effectiveness of units both clinically and financially throughout the country. As yet this does not exist.

The role of HDU in non-operative management

Many conditions fall traditionally within the care of general surgeons which may not require surgery. The most obvious of these include pancreatitis, closed chest trauma and head injuries. The department of surgery in Chester has an average annual thoughput of 7200 patients. One-third of these patients do not undergo surgery. Of the annual admissions to the Chester HDU, 30% never have an operation. The benefits that the HDU offers these patients include the ability to monitor perfusion and oxygen delivery, the facility to deliver CPAP, inotropic and renal support, and the delivery of appropriate pain relief. The centralisation of these patients and the allocation of highly trained nursing staff and medical staff is an extremely efficient way to deliver this care.

The role of the surgeon in postoperative care

In the United Kingdom, anaesthetists remain the largest group trained to deliver critical care. This has been the subject of debate, but the situation remains relatively unchallenged by surgeons in the UK. Surgeons seem prepared to relinquish this care to other non-surgical physicians, usually anaesthetists. The delivery of surgical care is usually seen as taking place in the operating theatre. This view fails to recognise the importance of time spent by surgeons in the non-operative care of patients.

It is important that surgeons in the UK continue to look after their patients in the postoperative period, using the most advanced techniques available. Spencer and Skinner *(25)* emphasise that the critical concept in surgical care is that the surgeon who operates on a patient is responsible for that patient and should remain the main clinician in

charge of the patient's care. Consultations may yield conflicting opinions, and it should be the operating surgeon who puts these into perspective. When all is said and done, it is the surgeon who ultimately knows whether a patient is too ill to have an operation, and also when he is too ill not to have an operation *(26)*.

Holcroft *(27)* has stated that as a profession we are "at risk of becoming itinerant surgeons who relinquish care to others". Walt *(26)* reports a survey of US surgical ITUs, observing that 54% of respondents felt that surgeons were abandoning ITU patients to non-surgical specialists. A survey of non-university affiliated ITUs revealed that in 70–75% of hospitals, surgeons were not the primary consultant for surgical ITU patients *(28)*. A comparison of teaching and non-teaching hospitals showed that most respondents preferred a surgeon in charge of the surgical ITU and felt that critical care was an essential part of surgery *(29)*.

Training aspects of high dependency care

To establish high dependency care as part of surgical management, it must be incorporated formally into surgical training schemes. This is a philosophy already supported by the Royal Colleges' guidelines for basic surgical training. The benefits of HDU care to the patient have been discussed, but the benefits to surgical trainees have yet to be defined. In Chester the HDU is under the administrative care of a member of the consultant surgical staff. Each patient remains under the care of his/her consultant who has the final role in decision making on a day-to-day basis. There is a dedicated SHO to the unit who has a minimal commitment to surgical activities outside the HDU and who works within a support framework to ensure easily available senior medical cover. The senior trained nurses remain an invaluable resource in this framework. Allocation to the HDU ensures that the trainee is exposed to a wide range of surgical conditions. Sick patients are centralised, and the SHO can expect training in the management of major postoperative cases, including pain control, fluid management, resuscitation and treatment of sepsis. Interventional techniques such as central venous cannulation and intercostal drainage can be undertaken. The HDU trainee is further supported by daily input from the pain control team, and the accessibility of ITU staff for advice.

The inclusion of critical care into surgical training can only improve the standard of care delivered in general to all surgical patients, while heightening the trainee's awareness of its benefits. Commitment to this training remains an essential component to its success.

Conclusions

The current provision of HDU care in the UK is inadequate, and reliance upon intensive care for the postoperative patient inefficient, expensive and often inappropriate. Surgeons should therefore learn and maintain the skills of critical care to ensure the best care for their patients. This will only be achieved by surgeons recognising the benefits of this critical care, teaching new surgeons about it and developing selection and audit techniques that will optimise it. Surgeons should not relinquish this challenge to other medical disciplines.

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CORRECTION

We apologise for an incorrect catchline citation at the heading of the article 'Randomised study of sterile *versus* non-sterile urethral catheterisation' by E A Carapeti, S M Andrews and P G Bentley in the March issue. This should read: *Ann R Coll Surg Engl* 1996; **78**: 59–60 and not *Ann R Coll Surg Engl* 1994; **76**: 59–60.