

## Accurate assessment of recovery after anaesthesia

David J Wilkinson\*

\* Emeritus Consultant Anaesthetist, Boyle Department of Anaesthesia, St. Bartholomew's Hospital, London EC1A 7BE, UK.

### INTRODUCTION

With the advent of modern anaesthesia, in Boston, USA in October 1846, came the introduction of a new speciality for which there was no established method of measurement of efficacy or safety. For the first time patients were deliberately made unconscious and then brought back to their normal conscious level; some died and others developed new symptoms that were short lived or long lasting. Observations were made about the recovery process and data began to be collected. Over the years this process has been refined but until recently no significant measure has been available to measure a quality in recovery for all patients. This paper will outline the formative developments in this evolution and outline the process required to measure a quality of recovery.

### EARLY DAYS

After the initial public demonstrations of anaesthesia in Boston and London in the late autumn of 1846 the focus was on the fact that the patients had survived inhalation of ether, they had experienced no pain during their operations and were relatively well afterwards (although Gilbert Abbott stayed as an inpatient for almost 3 weeks after his neck surgery in Boston!) Deaths following surgery took place in England soon after the introduction of ether anaesthesia and even though one such death was a week after the patient had left hospital the local coroner blamed the anaesthesia!<sup>(1)</sup>. Some deaths were more obviously anaesthesia linked and Hannah Greener died in early 1848 during a chloroform induction for the removal of an ingrowing toe nail<sup>(2)</sup>.

John Snow in London made observations relating to recovery after anaesthesia in his book on ether anaesthesia published in 1847<sup>(3)</sup>. «*In all the cases I have witnessed the patients have recovered their mental faculties very promptly and completely after the conclusion of the operation,*

*generally within a few minutes, and in two or three cases only has the period of recovery been delayed for half an hour*». He added more details in his book on Chloroform published after his death in 1858; «*Old people are often longer than others in awakening from the effects of chloroform owing, no doubt, to their slower breathing and circulation. Children on the other hand usually recover very quickly from its direct effects but they often lapse into natural sleep which lasts a considerable time, often hours, if they are not disturbed and if there is no painful wound*»<sup>(4)</sup>.

In 1895 Harvey Cushing introduced the anaesthetic chart and recorded the pulse rate, respiration and blood pressure at regular intervals throughout each case and made observations about the patient's condition during recovery. Frederic Hewitt included a whole chapter on the subject of recovery in his textbook which ran to several editions<sup>(5)</sup>.

Thus by the early part of the 20<sup>th</sup> century the foundations of recovery from anaesthesia had been laid. There was a need to stay with the patient, measure some physiological variables, position the patient appropriately, observe and treat any after effects (like pain, nausea and vomiting) and lastly to record and investigate more serious events such as deaths.

### DEVELOPMENTS

With the development of newer drugs, better teaching, improved monitoring and greater specialization in the subject, so safety after surgery and anaesthesia improved. Deaths still occurred but these became rarer but exact figures were difficult to determine as no one knew the exact number of anaesthetics being administered anywhere. While these improvements were obvious in the more affluent areas of the world, this was not a universal finding. Many countries developed a system of central collection of mortality after surgery which were voluntary systems at first and then evolved into compulsory systems.

With the huge growth in day stay care so a new focus developed this was around rapid discharge from recovery areas and assessment of home-readiness. New scoring systems were introduced in an attempt to facilitate this process. The Aldrette 'postanesthetic recovery score' appeared in 1970 and after several modifications became the standard for determining a patient's readiness for discharge from a recovery unit. It focussed on basic physiology, the ability to move all four limbs, breathe deeply and cough, have a 'normal' blood pressure, be fully awake and maintain a normal oxygen saturation<sup>(6,7)</sup>. Chung modified this to create a Post Anaesthetic Discharge Scoring System (PADSS) in 1995 which gave a better indication of readiness for home. It focussed on normality in cardiovascular signs, the ability to walk, the ability to tolerate oral fluids and pass urine and the presence of only minimal nausea or surgical bleeding<sup>(8)</sup>.

### FOCUS ON QUALITY

In the late 1990s Paul Myles developed a new scoring system to look closely at recovery after anaesthesia and surgery. He published a series of papers relating to a variety of scales of differing complexity<sup>(9,10)</sup>. The QoR9 scale used in the latter paper compared patient satisfaction scores with his own 9 aspects of a Quality of Recovery (QoR9) and found good correlation. The 9 items were; a feeling of well being, a sense of support from others, the ability to understand instructions, look after personal toilet and pass urine, the ability to breathe easily and be free from headache, nausea and severe pain. The Myles system was an enthusiastic step forward but failed to achieve widespread support and use within the rest of the anaesthesia community. The reasons for this lack of support are not obvious. However at the same time an increasing emphasis began to be placed on the measurement and evaluation of cognitive changes following anaesthesia and surgery. Most obvious in the elderly population it was apparent that many patients suffered significant deterioration in mental function often after seemingly uneventful procedures. The measurement of this loss was not simple and required expert neuropsychological evaluation with a battery of tests which took at least an hour to perform. Such testing could not be a routine matter and multiple tests over several time points were needed to demonstrate deterioration in intellectual function which might be fleeting or permanent. In addition many elderly patients presented with some degree of early dementia which tended to complicate measurement of function. An added challenge was the realization that the greater the number of neuropsychological tests that were performed then the greater the incidence of dysfunction that appeared.

### SOMETHING HAPPENING

It is apparent that all anaesthetists are different. They use different drugs in different combinations for differing lengths of time and yet most patients appeared to be quite similar on emergence from anaesthesia. Subtle aspects of individual practice could not be shown to have significant effects and yet it remained commonplace for some individuals to prefer the care provided by specific anaesthetists for close members of their own families. While classical analysis of morbidity and mortality from anaesthesia remains a popular investigation this type of data collection is manifestly unsatisfactory for proper analysis of the benefits of individual techniques.

For many anaesthetists the experiences of patients beyond the immediate recovery area are largely unknown and yet patients and their carers are frequently disturbed by many of their postoperative experiences. In addition it is often very difficult to separate surgical sequelae from anaesthetic ones and each sub-set of the profession tends to blame the other for any unexpected symptom.

### AIM

In 2008 a group of anaesthetists with an interest in recovery came together to see if a new post operative recovery scale could be designed. This scale would need to be able to detect an early recovery quality, track that recovery over time, include a full analysis of recovery including intellectual ability and be valid for all ages, cultures and languages. After recruiting the services of a project manager, a neuropsychologist and medical statisticians this group of clinicians produced a potential scale that was then tested in a pilot study. The practicality of the test was checked, the distribution of responses analysed and the sensitivity of the various questions determined. This led to a revision of the scale prior to its use in a larger study which recruited patients from China, Mexico, Australia, USA, France, Germany and UK with all questionnaires using local languages.

### STUDY

The new scale, a Postoperative Quality of Recovery Scale (PQRS), has been used to collect data on over 700 patients and the results of this work will be published later this year<sup>(11)</sup>. The work was performed using an unrestricted educational grant from Baxter Healthcare. The results will be discussed in the presentation but preliminary analyses suggest that anaesthesia and surgery are linked with significant post operative dysfunction. The aetiology of this dysfunction will hopefully be determined through further research work and the outcome will hopefully be a safer and better experience for all surgical patients.

## REFERENCES

1. Duncum BM. The development of inhalation anaesthesia. Oxford University Press. London. 1947:165.
2. Duncum BM. The development of inhalation anaesthesia. Oxford University Press. London. 1947:195-6.
3. Snow J. On the inhalation of the vapour of ether. John Churchill. London. 1847.
4. Snow J. On chloroform and other anaesthetics. John Churchill. London. 1858.
5. Hewitt FW. Anaesthetics and their administration. Macmillan and Co. London. 1901:493-500.
6. Aldrete JA, Kroulik D. A postanesthetic recovery score. *Anesthesia and Analgesia* 1970;49:924-934.
7. Aldrete JA. The post-anesthesia recovery score revisited. *Journal of Clinical Anesthesia* 1995;7:89-91.
8. Chung F, Chan VMS, Ong D. A post-anesthetic discharge scoring system for home readiness after ambulatory surgery. *Journal of Clinical Anesthesia* 1995;7:500-506.
9. Myles PS, Hunt JO, Nightingale CE. Development and psychometric testing of a quality of recovery score after general anesthesia in adults. *Anesthesia and Analgesia* 1999;88: 83-90.
10. Myles PS, Reeves MDS, Anderson H, Weeks AM. Measurement of quality of recovery in 5,672 patients after anaesthesia and surgery. *Anaesthesia and Intensive Care* 2000;28: 276-280.
11. Royse C, Newman S, Stygal J, et al. Development and feasibility of a scale to assess postoperative recovery: the Postoperative Quality of Recovery Scale. *Anesthesiology* 2010. In press.