BUTTERWORTH HEINEMANN

*Ambulatory Surgery*, Vol. 3, No. 4, pp. 205-207, 1995

0966-6532/95 $10.00 + 0.00

**S0966-6532(96)00003-0**

# The role of oxygen therapy in the recovery phase of day surgery

K J Fogg, P R I Saunders, D Wilkinson

Department of Anaesthetics, St Bartholomews Hospital, London EC1 7RA, UK

Oxygen therapy in the inpatient setting is standard practice in the postoperative phase. The aim of this study was to evaluate the need for the routine use of oxygen in the transit phase from the operating theatre to recovery, and its continued use in recovery, in patients undergoing day surgery. ASA I–II patients undergoing body surface surgery, using anaesthetic agents with a rapid recovery profile, are not subject to many of the factors that predispose to postoperative hypoxaemia. This study showed that in our unit the majority of patients do not require oxygen therapy in the theatre–recovery transit phase, and that attention to patient positioning, airway patency, and elimination of the second gas effect may be sufficient. Each day surgery unit (DSU) must make decisions on the need for postoperative oxygen therapy based on the unit layout and the condition of the patient.

Key words: Day surgery, oxygen therapy

## Introduction

Oxygen therapy after inpatient surgery is standard practice in the postoperative phase. Postoperative hypoxaemia is the result of many factors: upper airway obstruction, respiratory depression, altered $CO_2$ sensitivity, the second gas effect, a decrease in $SVo_2$, decreased functional residual capacity (FRC), increased closing volume and an increase in ventilation/perfusion (V/Q) mismatching. Major surgery is associated with constant or episodic decreases in oxygen saturation over up to five nights postoperatively[1], and postoperative confusion has been found to be associated with a decreased $Spo^2$ postoperatively[2]. These changes are not found in patients undergoing minor surgery[3]. Most day surgery patients are ASA I, unpremedicated and are undergoing body surface surgery with anaesthetic agents of rapid recovery profile. Therefore the factors that contribute to postoperative hypoxaemia may be minimized. The routine use of oxygen therapy for day surgery patients may thus be unnecessary, particularly with the advent of pulse oximetry.

## Methods

It is our standard practice not to give oxygen therapy in the theatre–recovery transit phase. One hundred patients in our day surgery unit (DSU) undergoing general anaesthesia were included in the study to re-evaluate this practice. All had a standard day case anaesthetic appropriate to their surgical operation. Details of age, sex, ASA status, smoking history, grade of anaesthetist, method of ventilation and analgesia were documented (Table 1). At the end of the procedure the patients were turned onto the lateral position and transferred to a trolley. During transfer to the recovery room, a distance of 70 m through two manually and two automatically operated doors, each patient breathed room air according to our standard practice. Airway support, state of consciousness and theatre–recovery transit time were noted. Average intraoperative $Spo^2$, in theatre and the first $Spo^2$ on arrival in recovery were recorded (Table 1). As in the study by Di Benedetto et al.[3] we chose to define an $Spo^2$ <94% as hypoxaemic. All patients judged as hypoxaemic on arrival in recovery were given oxygen via a face mask.

## Results

Of a total of 100 patients, 60 were female and 40 were male. The ASA status of the patients was: ASA I, 92; ASA II, eight (all male). Their age ranges were: female, 4–60 yr (mean 25 yr); male, 18–80 yr (mean 42 yr). Of the total, 32 patients had therapeutic abortions, 62 body surface procedures and six intra-abdominal surgery. Eighty-three patients were anaesthetized with opiates and/or non-steroidal anti-inflammatory drugs (NSAIDs) with the possible addition of local anaesthetic agents. Seventeen patients were anaesthetized with NSAIDs and/or local anaesthetic agents only. Twenty-five of the patients were smokers. A consultant

*Accepted:* 12 January 1996
*Correspondence and reprint requests to:* K Fogg, Dept. of Anaesthetics, St Bartholomews Hospital, Smithfield, London EC1 7RA, UK

**Table 1.** Day surgery centre pulse oximetry readings

Age:
Sex: M/F
ASA Grade:
Smoker: Y/N ?Chesty: Y/N
Operation: Body surface/intra-abdominal/other (specify)
Grade of anaesthetist:
Respiration: Spontaneous/IPPV
Analgesia: Local/opiate/NSAID
Average $SPo_2$ during anaesthesia:
?Problem with airway at end of procedure: Y/N, if yes please specify
State on leaving theatre: Awake/drowsy/unresponsive

Last $SPo_2$ in theatre ............................................................
First $SPo_2$ in recovery ............................................................
Time in transit to recovery ............................................................

**Table 2.** Summary of stastical analysis

Fisher's Exact Test; Rearranged table

| | | |
|---|---|---|
| 0 | 6 | 6 |
| 90 | 4 | 94 |
| 90 | 10 | 100 |

2-tailed probability (by summation) =0.000054

Uncorrected x2 = 37.5 $P<0.0001$
Yates-corrected x2 = 27.80671 $P<0.0001$.

Proportion difference = 0.4
Near exact (Mee) 95% confidence interval =
0.16818 – 0.687326

anaesthetist conducted 84 of the procedures. The mean transit time between theatre and recovery was 1 min (range 20 s–2 min).

Ranges in $Spo^2$ in theatre were 100–93% both during the procedure and as the last measurement before leaving. The range in recovery was 99–87%. On arrival in recovery 10 patients had an $Spo^2$ <94%. Of these, six were unresponsive, three drowsy and one awake. Four were smokers and four had intraoperative $Spo^2$ <94%. Of the other 90 patients whose saturation was >94% all were either drowsy or awake ($P<0.0001$ Fisher's exact test). Three patients had a documented airway problem; one required an oropharyngeal airway, one was described as snoring and one had bronchospasm. Seven had been given opiate drugs (Fig. 1).

## Discussion

Supplemental oxygen therapy seems to be administered out of habit rather than according to individual patient requirements. Whereas this use of oxygen is unlikely to harm any patient, it is probably not useful for the majority and does incur a cost penalty. It has been our observation that the placement of an oxygen mask on the patient is believed by some staff to provide a panacea cure, which then causes problems such as an obstructed airway to be overlooked. Russell and Graybea[4] showed that low $Sao^2$ in recovery correlated positively with patient age, body weight, ASA status, general anaesthesia and administration of large volumes of fluid. No correlation with opiates was found. The paediatric population show a greater tendency to desaturate, especially in the first 10 min postoperatively, and here the length of the procedure and not the use of opiates is important[5]. A video surveillance study in

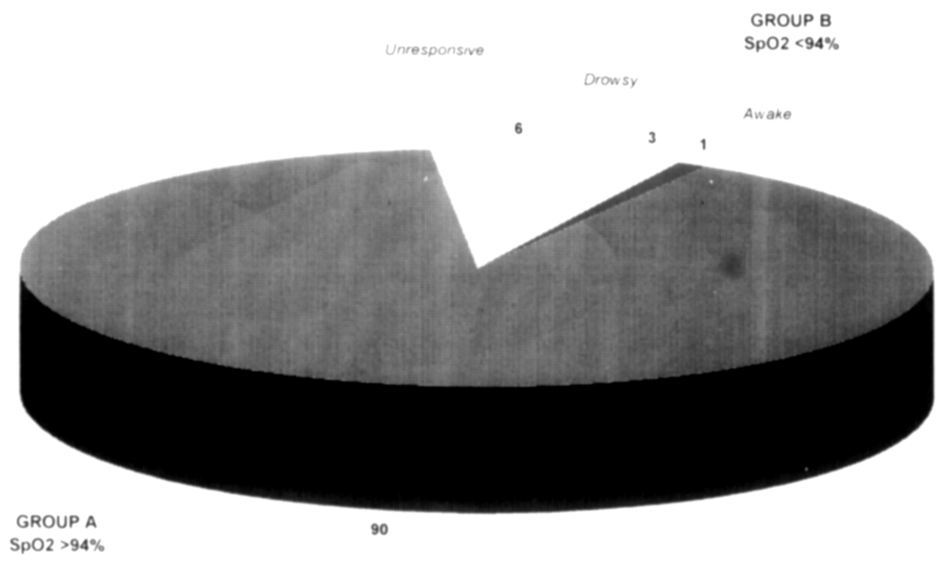


**Figure 1**

inpatients[6] showed how often the oxygen facemask is removed either by the patient or by the nursing staff, thus rendering the treatment intermittent at best. Many patients find oxygen masks claustrophobic and nasal spectacles uncomfortable.

Our study shows that, in the majority of patients, oxygen therapy is unnecessary in the theatre–recovery transit phase. This is in itself the most likely time for desaturation, after the patient has been transferred from operative table to trolley and is then transported, usually with no monitoring, into the recovery area. We have also identified a group of patients who are at risk of hypoxaemia, namely the unresponsive patient, and those with previous intraoperative desaturation, prior to transfer. The cause rather than the effect should be treated here, with attention to patient positioning, airway patency with or without aids, and elimination of the second gas effect by extended oxygenation in the theatre before transfer. In certain situations where the patient's condition is already optimized, oxygen may still be required for transfer, either as a result of patient factors or difficulties in a prolonged transfer, i.e. the anaesthetist being required to perform multiple tasks such as opening doors and steering the trolley as well as maintaining the airway. Pulse oximetry in this situation would alert the anaesthetist to any desaturation occurring despite oxygen therapy.

This lack of requirement for supplemental oxygen therapy may extend into the recovery phase after transit. Monitoring the $Spo^2$ with the aid of continuous pulse oximetry in the recovery area has been shown to reduce the incidence of episodes of desaturation[7], and so we suggest that in the day surgery setting, attention to the airway, patient positioning and continuous pulse oximetry measurement may be sufficient for most patients, to prevent hypoxaemia. This would represent not only a potential increase in patient comfort but also a cost saving by reducing the use of the disposable equipment required for the delivery of oxygen. The need for individual oxygen cylinders on trolleys, with the expense and upkeep that they entail, particularly in the high turnover environment of day surgery, would also be eliminated. We would recommend that each DSU assess its own facilities, such as transit time from theatre to recovery, usage of lifts and the case mix of patients with respect to ASA, age and type of surgery, with a view to assessing feasibility for changing the routine use of supplemental oxygen. Are we treating the patient or ourselves?

## References

1 Rosenberg J, Ullsted T, Rasmussen J, Hjorne F, Poulsen N, Goldman M. Time course of postoperative hypoxaemia. *Eur J Surg* 1994; **160**: 137–43
2 Rosenberg J, Kehlet H. Postoperative mental confusion – association with postoperative hypoxaemia. *Surgery* 1993; **114**: 76–81
3 Di Benedetto R, Graves S, Gravenstein N, Konieck C. Pulse oximetry can change routine oxygen supplementation practices in the postanaesthesia care unit. *Anaesth Analg* 1994; **78**: 365–8
4 Russell G, Graybeal J. Hypoxaemic episodes of patients in a postanaesthesia care unit. *Chest* 1993; **104**: 899–903
5 Tomkins D, Gaukroger P, Bentley M. Hypoxia in children following general anaesthesia. *Anaesth Intens Care* 1988; **16**: 177–81
6 Nolan K, Baxter M, Winyard J, Roulsen C, Goldhill D. Video surveillance of oxygen administration by mask in postoperative patients. *Br J Anaesth* 1992; **69**: 194–6
7 Moller J, Jensen N, Espersen K. Hypoxaemia is reduced by pulse oximetry monitoring in the operating theatre and in the recovery room. *Br J Anaesth* 1992; **68**: 146–50