

## EDUCATION IN PRACTICE

# Safe sedation practices among gastroenterology registrars: do we need more training?

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## ABSTRACT

Endoscopy training is a central component of gastroenterology training for the vast majority of UK trainees, and integral to this is the practice of safe sedation. The majority of endoscopic procedures are performed with the patient under conscious sedation with a benzodiazepine, often combined with an opioid. Little data exists on the practice of sedation among gastroenterology trainees, including their degree of knowledge of the common sedation agents used and their actions. Using both an online and paper-based questionnaire, we surveyed current gastroenterology speciality trainees (ST) in the UK and received 78 responses giving a response rate of 10%. Fifty-one per cent of the trainees did not receive structured training in safe sedation, despite national guidelines advising this to be an essential part of the training programme, and 92% felt a structured sedation course would be beneficial. We also identified some gaps in trainees' knowledge of the action of sedation agents. We propose that a formal training session in sedation or an e-learning module could be incorporated as part of a deanery or trust induction for gastroenterology trainees and kept under regular review.

## INTRODUCTION

The increasing volume of therapeutic endoscopy coupled with more procedures conducted on an ever-ageing population has led to a greater emphasis on performing safe sedation in the endoscopy department. The majority of endoscopic procedures are performed with the patient under conscious sedation.<sup>1</sup> The aim is to minimise anxiety and discomfort in order to complete the procedure safely and successfully.<sup>1</sup> The most commonly used sedation agents are opioids (usually fentanyl) and midazolam, which

are both given intravenously.<sup>2</sup> Patients may also opt to have the procedure performed unsedated or use suitable alternatives such as Xylocaine throat spray or nitrogen oxide (Entonox), although the latter is used infrequently in the UK.<sup>3</sup>

The Department of Health sets out a list of 'never events', which are defined as serious, but preventable, patient safety incidents.<sup>4</sup> These include over sedation with midazolam and failure to monitor or to respond to oxygen saturations; both are not uncommon events.

The British Society of Gastroenterology (BSG) published guidelines for the administration of safe sedation in 2003, which clearly stated that 'safety will only be optimised if practitioners use defined methods of sedation for which they have received formal training'. Following on from this in 2004, the National Confidential Enquiry into Patient Outcome and Death (NCEPOD) highlighted that only 35% of endoscopists surveyed were known to have attended a course on safe sedation.<sup>5</sup> This report recommended that all those responsible for the administration of sedation in the endoscopy department should receive formal training, and clear protocols for the administration of sedation should be made available and implemented.

Sedation protocols and auditing their use as well as their reversal agents are quality and safety indicators as set out by The Joint Advisory Group (JAG) on gastrointestinal (GI) endoscopy who regulate gastroenterology training in the UK.<sup>6</sup> In 2004, JAG developed the Global Rating Scale (GRS), a patient-centred web-based self-assessment tool, to evaluate and improve all aspects of endoscopy.<sup>7</sup> Patient



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safety and comfort is assessed using this tool under the domain of clinical quality and integral to this is the use of safe sedation.<sup>8</sup>

Despite these frameworks and recommendations set out by both NCEPOD and JAG, there have been very few studies to date that survey the current practice and level of training among gastroenterology trainees. Therefore, the primary aim of this study was to establish whether gastroenterology trainees had received any formal training in administering safe sedation in the endoscopy department and explore how this training was delivered. The secondary aim was to determine trainees' current practices in delivering the common sedation agents, including midazolam and fentanyl.

## METHODS

A 19-question survey (table 1) was developed, which was distributed at a gastroenterology training course held in London and also made available online using the web-based Survey Monkey.<sup>9</sup> A direct link for the survey was e-mailed to all trainee members of the BSG. Data was collected from December 2013 to June 2014. The lines of enquiry were the trainee grade, deanery, whether formal training in sedation had been received, and, if so, in what format had this training been delivered. Trainees were asked not to consider the 'Basic Skills in Upper GI Endoscopy' when answering this question as this course is a mandatory requirement by JAG, and we wanted to elicit whether additional focused training in sedation had

**Table 1** Full list of questions asked in the national training survey

Question	Answer format
1.1. What is your current level of training?	Tick box answer ST3/ST4/ST5/ST6/ST7/ST8/Other
1.2. Where do you work? Deanery	Free text box
2.1. Have you received formal training in sedation for endoscopy?	Yes/No
2.2. If yes, please tick all that apply	Tick box answer A dedicated course in safe sedation (excluding JAG Basic Skills in Upper GI Endoscopy Course)/Local trust induction/E-learning
3. Do you think receiving an introductory course or lecture in sedation at the beginning of endoscopy training would be useful?	Yes/No
4. Are you aware of a protocol in your endoscopy department for the administration of sedation?	Yes/No/Don't know
5. Are you aware of where reversal agents for sedation are located in your department?	Yes/No
6. Which opioid is used as first-line in your department?	Tick box answer Fentanyl/Pethidine/Other
7. How often do you use an opioid when performing diagnostic upper GI endoscopy?	Tick box answer Always/Very often/Sometimes/Rarely/Never
8. Are the majority of diagnostic upper GI endoscopies that you perform sedated or unsedated (throat spray only)?	Sedated/Unsedated
9. Which do you choose to administer first when performing a diagnostic colonoscopy?	Opioid (fentanyl/pethidine) followed by midazolam/Midazolam followed by opioid (fentanyl/pethidine)/Other regime (please specify)
10. On average, what dose of midazolam do you administer?	Free text box _mg
10.1 For diagnostic upper GI endoscopy?	
10.2 For diagnostic colonoscopy?	
11. What is the maximum dose of midazolam that you would feel comfortable giving?	Free text box _mg
12. What is the maximum dose of fentanyl that you would feel comfortable giving?	Free text box _µg
13. What initial dose of midazolam do you use for an elderly patient undergoing	Free text box _mg
13.1 Upper GI endoscopy	
13.2 Colonoscopy	
14. How long does midazolam take to act?	Tick box answer <1 min/1–2 min/3–5 min/>5 min
15. When is the peak effect of midazolam?	Tick box answer <1 min/1–2 min/3–5 min/>5 min
16. How long does fentanyl take to act?	Tick box answer <1 min/1–2 min/3–5 min/>5 min
17. When is the peak effect of fentanyl?	Tick box answer <1 min/1–2 min/3–5 min/>5 min
18. What is the reversal agent for midazolam?	Free text box Tick box: don't know
19. What is the reversal agent for fentanyl?	Free text box Tick box: don't know

JAG, Joint Advisory Group; ST, speciality trainees.

been undertaken by the trainees. Trainees were also asked if they were aware of a local protocol for sedation in their hospital, and whether they were aware of where reversal agents for opioids and midazolam were located. The final part of the questionnaire asked trainees to record their current practices of midazolam and opioid administration as well as to undertake a knowledge test on the basic pharmacokinetics and reversal agents of both drugs, respectively. Data was analysed using descriptive statistics with Microsoft Excel. When analysing the data, the trainees were also split into two cohorts, those who had attended formal training in sedation and those who had not received any formal training, to compare and contrast the results from these two groups.

## RESULTS

Seventy-eight specialist registrars in gastroenterology responded to the questionnaire out of 758 BSG trainees nationwide, giving a response rate of 10%. The majority were trainees based in London (51%) with the rest of England (46%) also well represented. The remaining 3% were from Wales, Scotland and Northern Ireland.

Only 49% of the responding trainees reported having received formal training in sedation for endoscopy, predominantly at local trust inductions (32%) or a dedicated course in safe sedation (46%) (table 2). Less than half of the trainees (46%) were aware of their local trust protocols for sedation in endoscopy.

All the trainees surveyed knew the correct reversal agents for the commonly used sedation agents in endoscopy, but 19% were unsure where reversal agents were kept in their department.

Overall, fentanyl was the first choice of opioid agent used with 70% preferring to use this drug over pethidine among those who had attended formal sedation courses compared to the non-formally trained cohort where 63% used fentanyl as their first-line opioid (table 3).

Sedation was found to be used rarely in diagnostic upper GI endoscopy with the majority electing to use Xylocaine throat spray, irrespective of whether the trainee had received formal training in sedation or not. Twenty per cent of the trainees who had received formal training in sedation stated that they performed the majority of upper GI endoscopies using some form of sedation, compared to 26% in the non-formally trained cohort (table 4).

**Table 2** Formal sedation training received

Delivery of sedation training	Percentage
Anaesthetic training on sedation	9
Dedicated course in safe sedation	46
e-Learning	13
Local trust induction	32

**Table 3** First-line opioid used in department

First-line opioid used	
Formal sedation training	
Fentanyl	70% (26)
Pethidine	30% (11)
Non-formal training sedation training	
Fentanyl	63% (22)
Pethidine	37% (13)

When trainees were asked how often they used an opioid during upper GI endoscopy, 74% of formally trained responders opted for 'rarely or never' compared to 71% in the non-formally trained group (table 5). Furthermore, 5% in the non-formally trained cohort stated that they used opioids 'very often'.

Ninety-five per cent of trained responders correctly used an opioid followed by midazolam in their sequence of sedation agents when performing colonoscopy. This was 86% in the non-formally trained group (table 6).

All trainees suggested reasonable average doses for midazolam use in upper GI endoscopy and for diagnostic colonoscopy. The majority of trainees stated appropriate estimates for the maximum safe dose of midazolam and fentanyl and tended to use an initial dose of 1 mg of midazolam for elderly patients undergoing gastroscopy and colonoscopy (table 7).

Both trained and untrained cohorts stated reasonable times for the duration of action of fentanyl and midazolam and the peak of their effects. Ninety-one per cent of responders felt that a formal introductory course in sedation would be useful.

## DISCUSSION

A wide cross section of current gastroenterology trainees were surveyed, ranging from speciality trainees ST3 to ST7 representing a wide spectrum of experience. To our knowledge, this is the first nationwide study to investigate gastroenterology trainees' perceptions and the practice of sedation in the endoscopy department. The curriculum for gastroenterology training in the UK recommends that trainees ensure

**Table 4** Use of sedation among trainees relative to training status

Are the majority of OGDs you perform sedated?	
Formal training	
Yes	20% (8)
No	80% (30)
Non-formal training	
Yes	26% (10)
No	74% (28)

**Table 5** How often do you use an opioid when performing diagnostic upper GI endoscopy?

How often do you use an opioid for upper GI endoscopy?	Percentage
Formal training	
Always	0
Very often	0
Sometimes	26
Rarely	51
Never	23
Non-formal training	
Always	0
Very often	5
Sometimes	24
Rarely	34
Never	37

knowledge of the principles and details of safe endoscopy practice and awareness of the pharmacology of the frequently used drugs.<sup>10</sup> Sedation carries with it a 1% risk of hypotension, aspiration, desaturation and bradycardia during endoscopy.<sup>11</sup>

Our findings highlight that only 49% of our cohort of trainees surveyed had received formal sedation training, which compares to the NCEPOD report findings of just 35% having received formal training in 2004. This suggests that we are still falling short of NCEPOD recommendations that all individuals responsible for administering sedation in endoscopy should receive formal training to administer these agents. Those trainees who had received formal sedation training mostly did so, on a dedicated sedation course. This demonstrates that trainees are currently seeking out their own formal sedation training, which suggests deficiencies in the national training programme and in local departmental inductions. Some sedation training is incorporated into the mandatory JAG training courses; Basic Skills in Upper or Lower GI Endoscopy. However, trainees are advised to book into this course after having had some experience in performing these procedures beforehand. As a result, most trainees will have already administered sedation to patients before attending this course. These are also both 'one-off' courses and the trainee will not benefit from revision of the principles and practice of

**Table 6** Order of agents used in colonoscopy

Which do you administer first when performing colonoscopy?	
Formal training	
Opioid followed by midazolam	95% (35)
Midazolam followed by opioid	5% (2)
Non-formal training	
Opioid followed by midazolam	86% (30)
Midazolam followed by opioid	14% (5)

sedation. It is likely that most sedation training comes from the trainee's supervisor during 'training' endoscopy lists; however, there is likely to be insufficient time to discuss the agents given in detail at these times. The vast majority of trainees have indicated that they would value timely formal sedation training with incorporation into local induction.

Most trainees are not aware of a sedation protocol in their department. Lack of consistency of practice within and between endoscopy units can increase uncertainty for the trainee. Differences in practice were reflected in the range of average and maximum doses for sedation agents given by trainees with some trainees reporting being comfortable using up to 10 mg of midazolam or 200 µg of fentanyl. The BSG recommends an average dose of no more than 2 mg of midazolam in the case of elderly patients (defined as over the age of 70 years), while in a fit young adult, a dose of 5 mg might be more appropriate.<sup>3</sup> These guidelines also advise that doses of fentanyl and pethidine should not exceed 100 µg and 50 mg, respectively, and that a dose reduction of 50% is required in the elderly population.

Most trainees do not use an opioid or sedation for upper GI endoscopy, but those trainees who had received formal sedation training were more likely, during colonoscopy, to administer an opioid first, before midazolam.

We found generally good trainee understanding of basic pharmacokinetics of sedation agents, but did identify some gaps in trainees' knowledge of the action of sedation agents. Most trainees knew the recommended maximal doses for midazolam and fentanyl and were appropriately cautious with sedation in elderly patients.

There are several limitations to this study. The number of respondents was small compared to the UK total trainee cohort, giving a response rate of 10%. In addition, the majority of trainees surveyed were from England, making it difficult to generalise these results to apply to the whole of the UK. The small number of respondents also means that differences between the 'received training' and 'did not receive training' cohorts, with respect to subsequent sedation practice, cannot reach statistical significance; so, scientifically robust conclusions cannot be drawn.

## CONCLUSIONS

From this study, we have concluded that the majority of trainees would value formal sedation training. We have also identified some gaps in trainees' knowledge of the action of sedation agents. Our findings highlight the need for a better structured training for gastroenterology trainees in the administration of sedation. Encouraging the practice of safe sedation will improve patient safety and help prevent 'never events' from occurring, and will also enhance the patient experience and comfort during the procedure. We

**Table 7** Assorted knowledge on dosage of sedation agents—data divided by cohorts

Average dose of midazolam for upper GI endoscopy	
Formal training in sedation, mg	
1–2	74% (29)
2.5–3	26% (10)
Non-formal training in sedation, mg	
1–2	87% (33)
2.5–3	13% (5)
Average dose of midazolam for colonoscopy	
Formal training in sedation, mg	
1–2	65% (24)
2.5–3	35% (13)
4	0% (0)
5	0% (0)
Non-formal training in sedation, mg	
1–2	68% (23)
2.5–3	23% (8)
4	6% (2)
5	3% (1)
What is the maximum dose of midazolam that you would feel comfortable giving?	
Formal training in sedation, mg	
2	0% (0)
3	2.5% (1)
4	10% (4)
5	72% (28)
6	2.5% (1)
7	2.5% (1)
8	2.5% (1)
10	8% (3)
Non-formal training in sedation, mg	
2	3% (1)
3	5% (2)
4	13% (5)
5	68% (26)
6	8% (3)
7	3% (1)
8	0%
10	0%
What is the maximum dose of fentanyl that you would feel comfortable giving?	
Formal training in sedation, µg	
50	8% (3)
75	11% (4)
80	2.5% (1)
100	56% (20)
125	2.5% (1)
150	14% (5)
200	6% (2)
Non-formal training in sedation, µg	
50	14% (5)
75	8.5% (3)
80	68.5% (24)

Continued

**Table 7** Continued

Average dose of midazolam for upper GI endoscopy	
100	6% (2)
125	3% (1)
150	0% (0)
200	0% (0)
What initial dose of midazolam do you use for an elderly patient undergoing upper GI endoscopy?	
Formal training in sedation, mg	
0.5	13.5% (5)
1	67.5% (25)
1.5	5% (2)
2	11% (4)
2.5	3% (1)
Non-formal training in sedation, mg	
0.5	13.5% (5)
1	73% (27)
1.5	2.5% (1)
2	11% (4)
2.5	0%
What initial dose of midazolam do you use for an elderly patient undergoing colonoscopy?	
Formal training in sedation, mg	
0.5	11% (4)
1	55.5% (20)
1.5	5.5% (2)
2	25% (9)
2.5	3% (1)
Non-formal training in sedation, mg	
0.5	12% (4)
1	47% (16)
1.5	9% (3)
2	29% (10)
2.5	3% (1)

propose that a formal training session in sedation or an e-learning module (drawing on the expertise from our anaesthetic colleagues) could be incorporated as part of a deanery or trust induction for trainees and regularly reviewed thereafter.

**Contributors** AM came up with the original idea for the study and helped design the questionnaire and wrote the main article. KB was involved in designing and distributing the questionnaire to trainees. She also wrote the discussion section of this article. AR helped design the questionnaire and provided the expert knowledge on the common sedation agents used. JG, collated the questionnaire data and performed the descriptive statistical analysis and created the results section. GJ was the senior author, who reviewed the questionnaire and this article prior to its submission.

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