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Research

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Abstract

Background

Paramedics are commonly called to attend patients complaining of nausea and vomiting, with the treatment of these conditions being either antiemetics or palliative measures. There are currently four antiemetics available to paramedics across Australia and New Zealand. Historically, the use of these medications, or previous medications not available in current practice, has varied dependent on each region of practice.

Objective

We aimed to create a snapshot in time and determine which antiemetics have been used by paramedics across their careers, their preferences of use, and their beliefs regarding each antiemetic.

Methods

Using an online survey, a cross-sectional and historical analysis of current and post-antiemetic use was conducted using a 5-point Likert scale and free text qualitative answers. Paramedics were invited to answer questions regarding their demographic, previous and current antiemetic medications used, and preferences regarding these antiemetics.

Results

A total of 476 paramedics participated in the study. Ondansetron was found to be the preferred antiemetic for most cases with nausea and vomiting (n=378, 82%) with the second line choice being metoclopramide (n=62, 13.4%). Exceptions to this were for prochlorperazine, which showed a high preference for nausea related to migraine (n=179, 56.2%) or vertigo or motion sickness (n=243, 42%).

Conclusion

Preferences and decision making for choosing ondansetron over other antiemetics were primarily its efficacy, minimal side effects and availability. Historically, metoclopramide has been the most common antiemetic in paramedic practice but is not generally preferred due to its contraindications, perceived lower efficacy over other antiemetics and risk of side effects.

Keywords

Paramedics; prehospital care; antiemetics; medication preferences; nausea and vomiting

Background

Paramedics in Australia and New Zealand are routinely called to clinical emergencies involving abdominal complaints such as nausea and vomiting. The aetiology of nausea and vomiting can be extensive (1), and the motion sickness associated with travel to hospital can often exacerbate these symptoms (2). The treatment of these conditions can vary considerably from passive approaches such as positioning, reassurance, cool air or cold packs to medication options such as oxygen and antiemetics (3). While there is significant literature exploring the preferences of physicians' opinions on antiemetics in various clinical settings (4-6), there is sparsity of studies exploring the perceptions of working paramedics within Australia and New Zealand to antiemetics. The present study therefore set out to explore the preferences and reasons for employing antiemetics in paramedic situations.

Methods

Design and instrumentation

In order to gain a clearer picture of paramedic antiemetic management preferences, a four-part survey was conducted. This survey set out to specifically identify which antiemetics and other therapies a paramedic may use and prefer for the management of nausea and vomiting. The survey was conducted through the online polling tool 'Survey Monkey', between September 2013 and August 2014. Responding to the survey was both voluntary and anonymous with no individual identifying information being recorded.

The survey was separated into four parts. The first section established demographics such as age, years of experience and area of practice. The second section focused on each paramedic's current scope of practice and antiemetics that they have employed across their careers. The third section set out to determine which antiemetics paramedics preferred to use in varying scenarios involving nausea and vomiting. These scenarios involved general preferences for first line antiemetic choice, specific aetiologies and patient populations such as paediatrics. The final section used a 5-point Likert scale (ranging from 1 = strongly disagree to 5 = strongly agree) and free text qualitative answers to identify particular views and beliefs on the efficacy of the varying antiemetics. These questions included specifics on the paramedic's belief for potential side effects, use of alternative treatments before antiemetic administration, and why they preferred a particular antiemetic medication.

Participants

The survey was distributed to paramedics via web links, bulletins, email and social media. Statutory ambulance services within Australia and New Zealand had the option to distribute the survey, not all opted to share. Specifically, New South Wales,

Western Australia, Northern Territory and Wellington Free Ambulance Service declined. The researchers note that although some states did not accept the offer of inclusion, members within their services still participated by self-selection. Information was provided to other bodies for distribution, such as university alumni, the Network of Australasian Paramedic Academics and Paramedics Australasia. Surveys were also distributed through Charles Sturt University's distance education programs to students who were already qualified paramedics.

Data from the report by the Council of Ambulance Authorities (CAA) estimates that there were a total of 9366 qualified paramedics working throughout Australia for the period 2012–2013 (7), this does not include communications officers, patient transport officers, students or base level ambulance officers. Additionally, it was estimated by the CAA that there are 1034 paramedics in New Zealand classified as a 'qualified ambulance officer'. Adding these numbers of potential qualified officers brings the total number to 10,400 paramedics who currently work for ambulance services within Australia and New Zealand.

To utilise an accurate representation of the total number of active paramedics, a sample size of a minimum of 370 responses was required. This was predicted using a Z-score of 1.96, a 95% confidence level, a 0.5 standard deviation with a 5% margin of error in order to meet statistical significance. Overall, the survey response was successful and received 476 responses, which well exceeded our target sample size of 370.

Data analysis

Data processing included the entry of all results into both Microsoft Excel and the Statistical Package for the Social Sciences (SPSS) version 20. SPSS was used for data storage, tabulation and analysis and the establishment of descriptive and bivariate statistics for the quantitative data (8). Descriptive statistics, t-test or one-way analyses of variance (ANOVA) test was used to compare the differences between gender, age group, level and years of experience, location and antiemetic preferences. Thematic analysis was completed for the free text, qualitative answers. All confidence intervals are 95%, $p < 0.05$ is considered significantly significant and all tests are two-tailed unless otherwise stated.

Ethics

Ethics approval for this study was granted by Charles Sturt University Biomedical Sciences Minimal Risk Committee. Additional ethics approval was sought and gained by Ambulance Victoria Research and Evaluation, South Australia Human Research Ethics Committee and St John New Zealand. Other services who accepted participation in this study, and who are not stated, used the previously approved Charles Sturt University Ethics ruling.

Results

A total of 476 paramedics participated in the survey. All participants had current or previous qualifications relating to paramedicine and a scope of practice for providing patient care.

Participant demographics

The characteristics of the participants are described in relation to age, gender, years of experience, current practice level and localities where they have practised. Of the 476 participants involved in the study, 72.3% (n=344) were male. Participant ages were evenly distributed between 25–54 years, with only 16.4% (n=78) participants falling outside this range and the average age being 38.8 years.

All states and territories across Australia were represented with a strong participation from New Zealand. The majority of the responses came from Victoria (n=189, 39.7%), followed closely by St John New Zealand (n=139, 29.2%). This provided an important Australasian dimension to this study as paramedics often travel between services across both countries; 14.7% (n=68) had worked in more than one service. Most paramedics had less than five years experience 24.8% (n=118), followed closely by paramedics with 5–10 years experience at 22.3%

(n=106). The average experience level across the group was 11.44 years. Many paramedics had worked in more than two localities (n=226, 47.5%), and capital cities were the most prominent location for participants (n=246, 51.7%).

Antiemetic preferences results

Of the entire cohort, 63.3% (n=299) carried ondansetron. Within these results, 47.5% (n=141) also carried metoclopramide. In addition, metoclopramide was carried by 66.3% (n=313). Interestingly, 55.2% (n=173) of the group that carried metoclopramide did not have ondansetron; 34.2% (n=163) carried two or more antiemetics and 25.4% (n=121) had only ever used one antiemetic drug.

Table 1 lists the antiemetics available at the time of the survey. Interestingly, it appears that metoclopramide is as widely available as ondansetron across all cohorts. Prochlorperazine is also still widely used in a large proportion. Four respondents also added haloperidol as an option for an antiemetic. Table 2 shows previously available antiemetics. It is of note that metoclopramide was the most widely distributed antiemetic across all cohorts. Others that were mentioned in the comments included tropisetron, granisetron, droperidol, dimenhydrinate and cyclizine.

Table 1. Current available antiemetics (2014)

Answer options	Response percent	Response count
Ondansetron (Zofran)	63.3%	299
Metoclopramide (Maxolon)	66.3%	313
Promethazine (Phenergen)	6.6%	31
Prochlorperazine (Stemetil)	40.9%	193
Comments		4
	Answered question	472
	Skipped question	4

Table 2. Previous available antiemetics

Answer options	Response percent	Response count
Ondansetron (Zofran)	48.9%	223
Metoclopramide (Maxolon)	92.5%	422
Promethazine (Phenergen)	15.8%	72
Prochlorperazine (Stemetil)	42.8%	195
Others?		9
	Answered question	456
	Skipped question	20

Historically, as shown in the results, metoclopramide has been the most prevalent drug available. Based on the current data, ondansetron is the most predominant drug now used for first line administration, as indicated by current ambulance service guidelines and protocols with 56.8% (n=258), followed by metoclopramide at 42.5% (n=193). The majority of ambulance service providers appear to be transitioning to ondansetron as the first line antiemetic for all cases of nausea and vomiting. However, comments received via the qualitative data showed several services use guidelines that allow the paramedic to choose an antiemetic based on the patient's condition rather than indicate first or second line.

Table 3 shows the preferred first line antiemetic based on the paramedic's decision rather than guidelines. Overwhelmingly, participants choose ondansetron over other antiemetics. Many then argue that there should be more than one antiemetic available and that the patient's condition will determine the ideal antiemetic of choice. Table 4 exemplifies which antiemetics were the provider's first line choice in a number of common nausea and vomiting complaints.

The preferred route for administering the medication was by the intravenous (IV) route, 73.3% (n=376) with only a small preference for oral/sublingual (O/SL), 19.5% (n=92) or intramuscular (IM) 7.2% (n=34) administration. There were some significant differences using chi-square analysis of Fisher's exact (p=0.021) between male and female preferences, but both groups order of preferred route of administration was IV, O/SL followed by IM. Other interesting findings include that 41.5% (n=172) of participants stated that they had witnessed a tardive dyskinesia or dystonic reaction to metoclopramide.

Alternatives to antiemetic results

This survey also explored paramedics' views about using alternative techniques as adjuncts or instead of, antiemetics: 76.7% (n=365) indicated that they believed that one or more of the following – cool air, cool clothes or cold packs, positioning, reassurance, deep breathing – were also an effective means to control nausea and vomiting. Positioning was considered the most important factor of influence 70.9% (n=258). Considering this intriguing information, only 32.3% (n=134) stated they would attempt any alternative intervention beforehand.

Discussion

Although several ambulance service guidelines allow paramedics to select an antiemetic based on preference or patient condition, the results from our study showed that ondansetron was both the most common and preferred antiemetic by paramedic providers in Australia and New Zealand. In comparison to Mee, Egerton-Warburton and Meek's (4) antiemetic study, it is interesting to note that most emergency physicians (87.3%) prefer to administer metoclopramide over ondansetron for adult patients in the hospital setting. As both medications show similar efficacy for undifferentiated nausea and vomiting (9), this finding may be due to other influencing factors, such as cost and availability. However, in the present study the reasons reported behind paramedics' preference for ondansetron were due to its perceived efficacy over other antiemetics, quick onset, safety profile, minimal side-effects, lack of contraindications and the ability to administer to paediatric patients.

Table 3. Preferred antiemetic among paramedics

Answer options	Response percent	Response count
Ondansetron (Zofran)	82%	378
Metoclopramide (Maxolon)	13.4%	62
Promethazine (Phenergen)	2%	1
Prochlorperazine (Stemetil)	2.6%	12
Comments?		10
	Answered question	454
	Skipped question	15

Historically, metoclopramide has been the most common antiemetic in paramedic practice with 92.5% of providers in this survey reporting using it at some point during their careers. However, most paramedics did not prefer using metoclopramide over ondansetron or prochlorperazine due to its contraindications, perceived lower efficacy over other antiemetics and risk of side-effects. Recorded data on the side effects of metoclopramide show a significant portion of the participants (41.5%) reported seeing a tardive dyskinesia reaction with metoclopramide. Metoclopramide has been known to cause extrapyramidal side-effects, but the likelihood of such events has been researched to be less than 1% (10). This is an interesting result and one that could be investigated further to understand the complex nature of the outcome.

There were several other interesting findings with this study. Firstly, it was found that prochlorperazine was preferred over ondansetron (56.3% vs. 26.6%) for nausea and vomiting associated with motion sickness and vertigo. Current studies show 5HT₃ antagonists such as ondansetron are no better than placebo for nausea and vomiting with vertigo while antidopaminergic agents such as prochlorperazine have some benefit (11). Secondly, from our data, paramedics preferred prochlorperazine and metoclopramide for nausea and vomiting associated with migraines, which aligns with current research and treatment recommendations for migraines (12,13).

Lastly, promethazine showed zero preference for general nausea and vomiting with adult patients and was the least desired antiemetic among the four choices. This correlated with most paramedics (84.1%) feeling sceptical of its use as an antiemetic. In agreement with other empirical research, promethazine has been shown to be less tolerated and have

more side effects than other antiemetics (5,14,15).

An additional finding from the present study was that only 19.5% of paramedics in the survey preferred administering antiemetics orally or sublingual versus intravenously. These paramedics commented that oral ondansetron was 'non-invasive... effective... well tolerated... and easy to use'. It has been established that sublingual or oral ondansetron does demonstrate the same efficacy as IV preparations for nausea and vomiting in the postoperative setting (16). Furthermore, oral preparations also display efficacy for nausea and vomiting for paediatrics with gastroenteritis in the emergency setting (13). Despite research and a growing trend for using oral antiemetics, it is suggested that there is still a trend toward the use of IV administration and that the effective use of sublingual ondansetron may be overlooked in the pre-hospital setting. Further research would need to be done to establish the reasoning behind this observation.

Many respondents also believed that alternatives such as cool clothes, deep breathing, positioning and cool air relieved nausea and vomiting; 365 (76.7%) supported one of these alternative methods as an effective substitute to an antiemetic. However, only 134 (28% with 66 no responses) were willing to try alternatives before administering an antiemetic. Additionally, it was found that most providers disagreed (64.7% with 67 no responses) with the use of oxygen as a treatment for nausea and vomiting. Smith (3) noted that a randomised control trial found that oxygen may be an effective treatment for reducing nausea and vomiting in the paramedic setting. However, there were many limitations to this study and postoperative studies with oxygen and nausea have not generally yielded positive results to encourage its regular use (3,17).

Table 4. Preferred antiemetic for patient conditions

Answer options	Ondansetron	Metoclopramide	Promethazine	Prochlorperazine	None of these	Response count
... uncomplicated, general nausea or vomiting in adults?	312	102	1	12	10	437
... uncomplicated, general nausea or vomiting in paediatrics?	345	9	28	4	44	430
... uncomplicated, general nausea or vomiting in geriatrics?	329	77	2	11	8	427
... nausea and vomiting with motion sickness or vertigo?	115	22	40	243	12	432
... nausea and vomiting in an obstetric patient?	256	92	8	12	52	420
... nausea and vomiting in adult patients with gastroenteritis?	265	118	3	12	33	431
... nausea and vomiting in paediatric patients with gastroenteritis?	306	19	23	10	69	427
... nausea and vomiting in a patient with a migraine?	152	73	14	179	8	426
... nausea and vomiting associated with chemotherapy or radiation treatments?	351	55	3	17	4	430
... nausea and vomiting associated with pain medication usage?	271	140	4	10	8	433
... nausea and vomiting associated with general pain?	277	113	10	9	24	433
... prevention of nausea and vomiting?	243	93	11	43	40	430
						438
Answered question						438
Skipped question						38

Since paramedics report being less likely to use palliative options or oxygen in their treatment of nausea and vomiting, further analysis would be needed to evaluate the decision making process for choosing these treatment modalities for nausea and vomiting.

Limitations

There are several limitations to this study. Although our target sample size met statistical significance, it did not proportionally capture paramedics from each region across Australasia. This could potentially skew the preferences towards several particular regions of practice for treating nausea and vomiting. As paramedics practise with guidelines and protocols, medication choice and the reasoning behind some of the antiemetic preferences may have been influenced by guidelines or protocol, rather than experience and clinical decision making of the paramedic. Ultimately, the survey was designed to capture preferences and the reasoning behind those choices, rather than elicit results from particular protocols or guideline choices.

Conclusions

The data found in this survey captures a snapshot of current and historic antiemetic practice for paramedics throughout Australia and New Zealand. Historically, metoclopramide has been the most common antiemetic while ondansetron is currently the preferred antiemetic for paramedics. Reasons behind this preference included its perceived superior efficacy, minimal side effects and availability over other antiemetics used in paramedic practice (metoclopramide, prochlorperazine, promethazine and cyclizine). Research into paramedic decision-making and preferences regarding specific treatment modalities such as medication choice is limited and this article represents the first attempt at examining the reasoning beyond those preferences with antiemetics.

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Conflict of interest

The authors declare they have no competing interests. Each author of this paper has completed the ICMJE conflict of interest statement.

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