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Improving patient access to symptomatic treatment through self-serving nausea stations at Peace Arch Hospital emergency department

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ABSTRACT

Background Nausea is a common complaint among patients waiting at the emergency department (ED). Previous research indicates that isopropyl alcohol (IPA) can provide symptomatic relief for nausea. However, the number of studies investigating this effect is limited, especially in ED settings. This study investigates the effect of IPA administration on patients presenting with nausea to the ED. We aim to provide symptomatic relief to 20% of these patients.

Methods In the Peach Arch Hospital (PAH) ED, patients who reported feeling nauseous were provided with a single IPA swab, instructional materials and feedback surveys. Patients inhaled IPA at a self-serving booth and completed a standardised survey immediately after. Patients were included in the study if they presented with nausea and excluded if they were under the age of 18, were pregnant, were allergic to alcohol, had cognitive impairment and/or were taking disulfiram. Multiple plan-do-study-act cycles were implemented to refine this study, including changes in feedback collection, instructional materials and presentation of IPA swabs.

Results The total number of surveys completed over the 25-week period was 41 (n=41). These surveys showed that IPA inhalation is effective in improving nausea symptoms in the ED, with 53% of survey respondents suggesting 'great improvement' or 'good improvement'. 88% of respondents felt there was improvement in symptoms. There were very limited participants (12%) who reported that IPA administration showed 'no improvement'.

Conclusions Self-serving nausea treatment stations may be an effective strategy in alleviating symptoms for patients awaiting to be seen by a physician while in the ED. These stations can enhance patient care through rapid treatment, optimise resources by reducing workload on nursing staff, and empower patients to manage their own symptoms.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Isopropyl alcohol (IPA) inhalation has been shown to improve nausea symptoms in a limited number of studies with small sample sizes.

WHAT THIS STUDY ADDS

⇒ We can confirm and further corroborate the evidence that IPA swab inhalation indeed provides 'great improvement' or 'good improvement' to 53% of patients presenting with nausea to the Peach Arch Hospital emergency department (ED).

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ As a result of these findings, self-serving stations that provide IPA swabs and instructional materials may be implemented at local EDs to reduce ED wait times and enhance patient care.

INTRODUCTION

Nausea is a symptom with high prevalence among patients in Canadian emergency departments (EDs).[1] With over 15.5 million ED visits annually, resource-constrained EDs in Canada are in dire need of a rapid-acting, safe and efficient method to treat nausea.[2]

Traditionally, serotonin 5-HT-3 and 5-HT-4 receptor antagonists, dopamine D2 and D3 antagonists, anticholinergics and antihistamines have been the recommended treatments for nausea.[1] However, these medications have a delayed onset and an unfavourable adverse effect profile ranging from headaches and dizziness to sedation.[3] Current research indicates that isopropyl alcohol (IPA) inhalation may be more effective than traditional antiemetic medications. A recently published 2023 systematic review and meta-analysis of randomised controlled trials found IPA inhalation to significantly lower the time to 50% reduction in nausea and significantly reduce nausea at 30 min, compared with serotonin 5-HT3 antagonists.[4] However, most of these studies document the success of IPA in managing postoperative nausea and chemotherapy-induced nausea.[5 6] Previous studies have also investigated the reduction of nausea after IPA administration in EDs; however,

the number of studies and collective sample size is quite limited.[7 8]

IPA is a colourless compound found in common household products such as disinfectants, hand sanitisers and detergents.[9] The mechanism by which IPA alleviates nausea is not clearly understood. It has been postulated that the strong alcoholic odour of IPA initiates an immediate olfactory stimulus, which prevents the sensorineural signals that cause nausea from reaching the central nervous system.[9] The interruption of these sensorineural signals is expected to significantly reduce nausea.

Furthermore, administering IPA is simple and non-invasive, allowing for self-directed administration which reduces the burden on busy EDs. It also minimises potential drug interactions and adverse side effects caused by commonly prescribed pharmacologic interventions such as ondansetron (5-HT3 receptor antagonist) and metoclopramide (D2 receptor antagonist). Essentially, this low-cost, self-directed treatment option has the potential to improve ED efficiency, optimise resources and enhance patient outcomes. In addition to practicality, IPA encourages patient empowerment through self-serve stations where patients can manage symptoms of varying severity with a low-risk, highly effective treatment.

For these important reasons, we aim to provide symptomatic relief to 20% of patients presenting to the ED with a complaint of nausea via self-treatment stations. This potential will be discovered in this report as we evaluate the effectiveness of IPA in alleviating nausea for patients in the ED.

METHODS

This study was reported using the Standards for Quality Improvement Reporting Excellence guideline (SQUIRE).[10] The SQUIRE guideline checklist was completed (online supplemental file 1). Patients or the public were not involved in the design, conduct, reporting or dissemination plans of our research.

Context

Phase 1 of this study was conducted in the ED at Peace Arch Hospital (PAH) from August 2023 to June 2024. PAH is a community hospital in British Columbia with a growing number of patient volumes. Like many other EDs in Canada, PAH faces ongoing challenges related to high patient volumes, staff shortages and increasing wait times. Before the study, there were no formal protocols or resources for the immediate treatment of nausea in patients waiting in the triage area. This contributed to patients experiencing discomfort for a prolonged period. Additionally, staff workload was exacerbated by the high number of patients requiring symptomatic relief, which limited the capacity of healthcare providers to prioritise other critical tasks. The self-serving nausea booth was introduced as an innovative solution to empower patients to manage their symptoms autonomously while awaiting further medical attention.

Table 1 Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
1. Patients presenting with nausea in the ED.	1. Patients who are pregnant. 2. Patients under 18. 3. Patients with allergies to alcohol. 4. Patients with cognitive impairment. 5. Patients who are taking disulfiram.

Intervention

Initially, the intervention involved having triage staff give instructional materials and feedback surveys in the waiting room to patients experiencing nausea. The instruction form came with a single alcohol swab and had an option to scan a quick-response (QR) code to fill out an online survey according to the eligibility criteria (table 1). The triage nurses were oriented on how to implement this.

Over time, the intervention evolved through multiple plan-do-study-act (PDSA) cycles (table 2). Pens and additional instructions were provided, but this approach was abandoned due to the pens being easily lost. The instructional materials were then redesigned to include tear-off survey sections to reduce resource usage and simplify the return process. Distribution was expanded to nursing stations, which were equipped with survey feedback boxes and instructional materials. Attempts to use volunteers for distribution were unsuccessful, so nurses were incentivised with coffee cards to distribute the materials, resulting in a spike in survey response rates. A multilingual instructional video was created to demonstrate the proper use of the treatment, and the nausea scale was revised to include numbers and written descriptions for more accurate feedback. The alcohol wipes were rebranded in new packaging to better market the treatment, and self-serving nausea posters were crafted and placed in 19 locations across the ED, improving accessibility and increasing swab utilisation (online supplemental file 2).

Measures

The impact of the intervention was assessed using outcome measures, process measures and balancing measures (table 3). The outcome measures of the number of nauseous patients treated and perceived helpfulness were measured to investigate the effect of IPA inhalation on reducing the severity of nausea and to assess whether it was providing a net positive impact. The number of IPA swabs used was measured to determine the variations of use over the study period. On the other hand, process measures such as nausea patients flagged correctly were measured to ensure IPA treatment was provided to the appropriate patient population. Other process measures such as education of frontline staff and the number of surveys completed were measured to reduce biases. Finally, balancing measures such as patients returning within 72 hours were measures to determine if IPA

Table 2 Evolution of project approach through PDSA cycles

PDSA cycle	Plan	Do	Study	Act
Cycle 1	Distribute 10 instructional materials covering treatment, instructions and feedback surveys via triage nurses.	Materials distributed; feedback boxes set up to collect physical copies of surveys in waiting room.	10 handed out, 3 responses. Did not align with prediction.	Adapt. Provide more instructions and pens to patients.
Cycle 2	Continue distribution, add pens and more instructions to patients to increase survey response rates.	Distribute materials with pens in the waiting room.	Pens disappeared, no increase in responses underscoring impracticality of approach.	Abandon. Redesign materials so that there is no pen requirement.
Cycle 3	Redesign instructional materials with tear-off survey sections to reduce usage and simplify process to minimise reliance on pens and encourage more user feedback.	Implement redesigned materials with tear-off sections for easy return.	Feedback remained similar, but no pens needed so resources were reused.	Adopt. Continue using redesigned materials to avoid need for pens.
Cycle 4	Expand distribution to nursing stations, educate unit staff about project and instruct them to distribute materials when attending to patients.	Set up boxes at nursing stations so they could provide materials	More members onboarded but minimal distribution (five materials)	Adapt. Incentivise nurses to give materials to more eligible patients.
Cycle 5	Use volunteer for 2 hours in waiting room to assist with distribution of materials to patients, with guidance from nurse.	Volunteer spent 2 hours in the waiting room	No materials were distributed during the volunteer's time in the waiting room.	Abandon volunteer approach as effectiveness is questionable.
Cycle 6	Incentivise nurses with coffee cards to distribute more instructional materials to improve engagement among nursing staff	Created a holder to showcase instructionals with coffee cards and instructions on the incentivisation process.	Spike in response rates (13 responses) via online surveys and physical surveys.	Adopt. Continue incentivising nurses to hand out instructional materials.
Cycle 7	Providing a visual aid with translated instructions in three different languages will make usage of treatment more straightforward and effective.	Created and placed multilingual video in ER waiting room on an iPad.	Ongoing monitoring.	Ongoing monitoring.
Cycle 8	Random incentivisation for nurses to get similar results as the prior incentivisation (surge in survey completion).	Create clear instructions, incentivise nurses for engagement.	No significant spike in responses compared with previous trial.	Abandon incentivisation.
Cycle 9	Revise nausea instructional scale to include numbers and written descriptions to operationally define the scale and allow for more accurate feedback from patients.	Include written descriptions and numbers on instructionals.	Feedback from multidisciplinary group supports redesign to gather more accurate results.	Adopt redesigned instructional.
Cycle 10	Rebranding alcohol wipes for better marketing to increase usage.	Created specially marketed IPA wipes.	Trialled both marketed and generic brand, significant dip in swab utilisation when not branded.	Adopt use of branded swabs.
Cycle 11	Crafting self-serving posters with instructions and swabs will reduce burden on staff and enhance accessibility of treatment.	Created self-serving posters for 19 areas in ER.	Increase in swab utilisation observed.	Adopt. Will rely on self-serving posters more than instructionals.

ER, emergency room; IPA, isopropyl alcohol; PSDA, plan-do-study-act.

Table 3 Summary of outcome, process and balancing measures

Measure type	Description	Frequency	Collected by
Outcome measures	1. Number of nauseous patients treated	Monthly	Analyst
	2. Alcohol swabs used	Every 2–3 days	Coordinator/volunteer
	3. Perceived helpfulness	Weekly	Coordinator
Process measures	1. Nausea patients flagged correctly	Weekly	Project lead
	2. Frontline staff educated	Monthly	Coordinator/analyst
	3. Number of surveys completed	Daily to weekly	Coordinator
Balancing measures	1. Patients returning within 72 hours	Monthly	Analyst/coordinator
	2. Nausea-related interruptions at triage	Monthly	Volunteer/nursing staff

inhalation was providing sustained relief without complications and incorrect usage of the nausea booth was used to determine study validity.

Regular assessments and feedback from patients and staff were used to continuously adapt and improve the intervention, guided by team rounds. Furthermore, all collected data were reviewed at various time intervals ranging from daily to monthly. This was done to ensure completeness of data and to refine the study design depending on any initial flaws or oversights.

Analyses

Quantitative data from the surveys and utilisation metrics were examined using standard descriptive statistics, without applying any specialised statistical methods. We established a baseline of five swabs per poster to measure utilisation throughout our data collection phases. Variations or special causes were detected using the SQCpack, the software employed to produce our graphs.

RESULTS

Overall, our results found a positive reception of IPA treatment among patients who provided feedback. From our measure of perceived helpfulness, we found that having a self-treatment station in the ED improves nausea symptoms, with more than half (53%) of respondents saying there was 'great improvement' or 'good improvement'. 88% of respondents felt there was an improvement in symptoms. Only 12% of respondents found that there was no improvement from using the nausea treatment (figure 1).

The data on the number of swabs being used was obtained from self-serving posters (figure 2). Over 11 weeks, it was found that, on average, 105 swabs were used every week. More significant increases in usage were seen in the later weeks of data collection. This can be attributed to branded swabs being used in place of generic swabs, as well as an increase in data collection frequency from weekly to every 1–2 days from week 7 onwards.

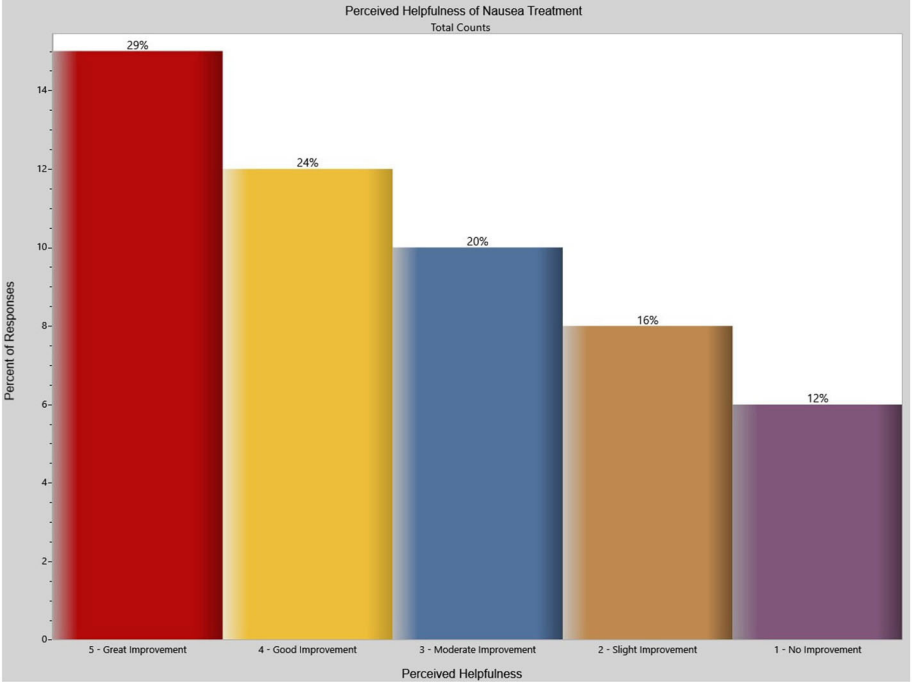

Figure 1 Perceived helpfulness of nausea treatment.

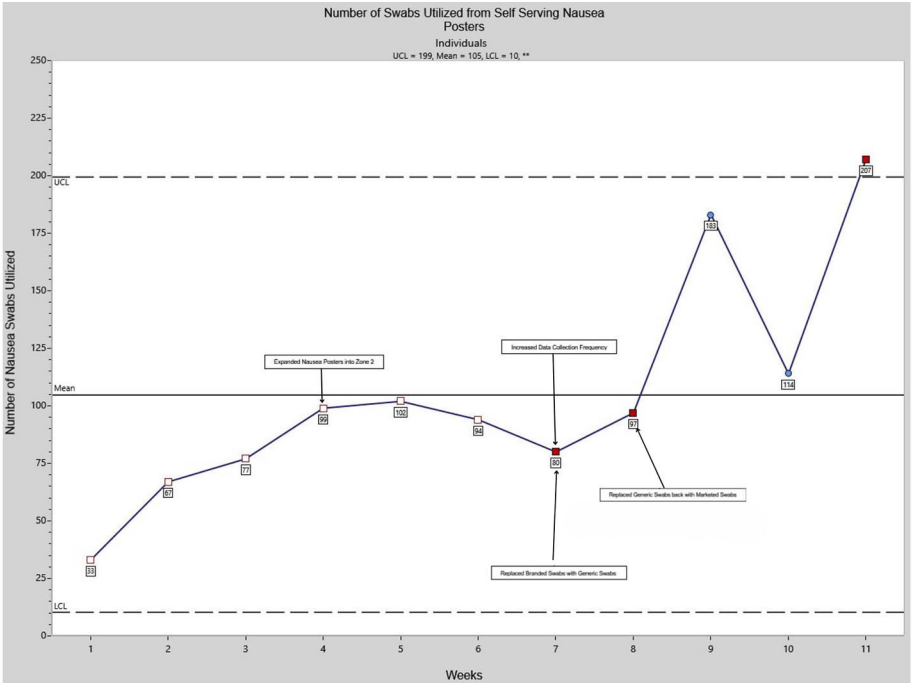

Figure 2 Number of swabs used from self-serving nausea posters.

The number of surveys (both physical and virtual) completed was also recorded over 25 weeks (figure 3). We found that incentivising unit staff with coffee cards led to a spike in virtual surveys completed. However, this was abandoned as continuous incentivising was unsustainable due to costs. By the 14th week of collecting these data, self-serving posters were distributed, with only a virtual survey option. The total number of surveys completed over a 25-week period was 41.

The process measures focused on aspects such as the number of nausea patients flagged by triage, the education of frontline staff and the completion of patient surveys. The number of nausea patients flagged by triage faced challenges, as there was often a discrepancy between the number of swabs taken and the number of patients flagged, indicating potential overuse or misuse of swabs. The approach of reviewing medical records of patients with a chief complaint of nausea and comparing

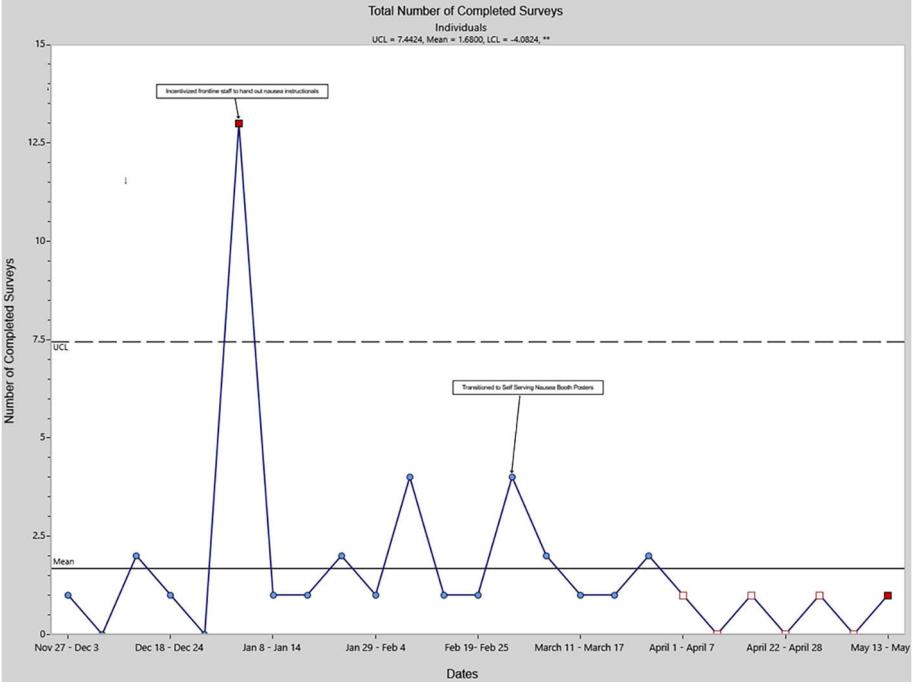

Figure 3 Number of physical and virtual surveys completed over time.

that with swabs used also led to a discrepancy, with more swabs taken than presenting patients.

The number of frontline staff educated on the project was based on attendance at education meetings. Additionally, the number of completed surveys was used as a measure of patient engagement and feedback on the intervention. Surveys were initially collected in both physical form and online formats via QR codes, but eventually transitioned to QR code only on self-serving posters. Despite these efforts, some patients took swabs without filling out surveys, leading to gaps in data.

Contextual elements also interacted with the intervention. Staff shortages affected the ability of nurses to distribute materials, leading to the implementation of self-treatment stations and posters in hopes of more patient engagement.

Observed associations between outcomes, interventions and contextual elements included a correlation between a significant increase in uptake of IPA swabs with the distribution of self-serving posters. Further, the association with poster location and treatment stage usage was recorded to create a map of the hotspot areas in the ED (online supplemental file 3). In addition to this, rebranding the alcohol swabs also demonstrated an increase in survey alcohol swab utilisation, indicating that marketing the treatment may be an effective approach.

Unintended consequences included unexpected benefits such as increased awareness and education among nursing staff regarding the management of nausea in the ED. However, problems such as the rapid disappearance of pens and the failure of the volunteer approach highlighted the need for more sustainable solutions. The expansion of distribution to nursing stations initially had minimal impact until the incentivisation of nurses. However, more sustainable approaches are needed for this to be effective in the longer term as this was an unanticipated cost.

Data on survey responses revealed that some physical survey forms were not returned despite usage of alcohol swabs. Utilisation data showed that more swabs were taken than patients presenting with nausea as flagged by triage nurses or electronic medical records, making it difficult to track the exact number of nauseous patients using the intervention. Moving forward, the project relied on the assumption that patients taking swabs were truly nauseous, although the exact usage patterns remained unclear. Self-treatment stations proved more effective at improving treatment uptake than unit staff handing out instructional materials and collecting surveys. This also helped reduce the burden on unit staff of providing instructional and feedback materials to patients. Due to these challenges, assumptions were made around self-treatment station use, including how many swabs people were taking, whether swabs were used correctly and whether the patients were nauseous. This also led to difficulties in measuring the number of patients returning within 72 hours as well as incorrect usage of self-treatment stations.

DISCUSSION

Summary

The key findings of this study indicate that implementing self-treatment stations in the ED can significantly improve the management of nausea among patients prior to being seen by a physician. Over half (53%) of the survey respondents reported experiencing 'great improvement' or 'good improvement' in their symptoms after using IPA swabs and 88% of respondents felt that there was 'slight improvement' or more. This was significantly higher than our initial aim of providing symptomatic relief to 20% of patients. This result supports the notion of IPA as a non-invasive and effective treatment option for nausea in an ED setting. The study also highlighted the benefits of self-serving booths, which alleviated some of the burdens on nursing staff and improved the accessibility of IPA self-treatment for relief.

The strengths of this project are its innovative approach to patient self-care, the refinement of intervention strategies through multiple PDSA cycles and the project's adaptable nature. The innovative approach empowers patients to manage their own symptoms, while also educating them on IPA administration for future use. The multiple PDSA cycles allowed for a refined approach where efficiency and effectiveness were improved over time. Furthermore, the project persisted and adapted in the face of challenges such as staff shortages and misuse of treatment stations. Finally, the introduction of multilingual instructional materials also held potential in enhancing accessibility of the intervention for patients more comfortable in non-English languages.

Interpretation

The positive association between IPA self-treatment and patient perceived helpfulness can be attributed to the effectiveness of IPA in alleviating nausea, as well as the convenience and accessibility of the self-treatment stations. It could also be attributed to the adjustments in intervention design made via PDSA cycles. These findings align with previous research indicating that IPA can be more effective than traditional antiemetic medications, especially in terms of rapid symptom relief.[4 5] The integration of self-serving booths also introduces a novel approach that addresses the practical challenges of high patient volumes faced by resource-constrained EDs.

Upon IPA administration, many patients experienced symptom relief from nausea, which likely improved their overall ED experience and reduced the amount of waiting time to receive treatment. Furthermore, the intervention reduced held potential to reduce the workload on nursing staff and optimised resources, demonstrating potential for a strategic trade-off between initial implementation costs and long-term efficiency gains for the healthcare system as well as enhanced patient care.

In analysing the data, certain self-serving hotspots within the ED were identified where swab utilisation was higher. These areas, such as near the triage waiting area and the waiting rooms of Zones 1 and 2, demonstrated

higher engagement with the self-treatment stations (online supplemental file 3) information is valuable for the next phase of the project, as strategically placing self-serving vending machines in these hotspots could further enhance accessibility for patients, potentially increasing the uptake and effectiveness of the intervention even more.

However, some discrepancies were observed between anticipated and actual outcomes. For example, not all patients who used the swabs completed the surveys. This discrepancy could be in part due to the self-serving nature of the intervention, making it difficult to ensure that all users provided feedback and had been experiencing nausea when using the intervention. High staff burdens and staff shortages also may have also influenced these outcomes, highlighting the importance of context in interpreting the results.

Costs of this intervention related to the production of instructional materials, rebranding of alcohol swabs and incentives for nursing staff. These costs were deemed necessary as part of the iterative process to understand which interventions were worth adopting. The strategic trade-offs included the opportunity costs of redirecting staff time and resources towards the intervention. However, these trade-offs were justified by the improvements in treatment uptake with the rebranding of swabs as well as deployment of self-serving nausea posters.

Lessons learned

Although the focus of this study was to improve access to timely symptom relief and patient satisfaction of the treatment, we recognise that additional outcome measures would have been useful to measure to better comprehend whole system effects. These measures may have included but are not limited to the impact of the IPA swabs on workflow, decreases in healthcare costs, overall patient satisfaction with total ED wait and the impact on availability of nurses with respect to decreasing wait times. These measures may be useful for future studies to research to build upon the results of our study.

Limitations

Several limitations were encountered in this study. One significant limitation was the inconsistency in survey responses, as some patients would take the alcohol swab without completing the feedback survey. This led to gaps in data and made it challenging to gauge the intervention's effectiveness based on patient feedback alone. Additionally, there were assumptions made regarding the self-treatment station use, including the number of swabs taken by each patient, the correct usage of the swabs and whether the patients using the swabs were experiencing nausea. These assumptions introduced potential biases and uncertainties into the data.

Efforts to retroactively analyse data through the 'Meditech' electronic medical records system to identify the number of nauseous patients were also problematic. The number of swabs taken often exceeded the number of patients presenting with nausea, indicating discrepancies and potential misuse of the swabs. This further complicated the accurate tracking of intervention usage and effectiveness.

While the self-treatment stations were more effective in improving treatment uptake compared with staff or volunteers distributing instructional materials, this approach also presented challenges. The bulk of the data relied on the assumption that patients taking the swabs were truly nauseous, which may not always have been the case. Additionally, balancing measures, such as tracking the number of patients who returned within 72 hours with the same symptoms or those who incorrectly used the nausea booth and posters, were difficult to monitor and quantify. The study was conducted in a single community ED, which may not be representative of all EDs in Canada, and therefore limits the potential generalisability of the findings. The internal validity of the study was also influenced by assumptions about the correct usage of swabs. These assumptions were necessary due to the practical constraints of the study. These limitations highlight the need for more robust data collection methods in future studies to ensure the accuracy and reliability of the findings. Efforts were made to minimise these limitations through regular feedback and adjustments based on PDSA cycles. However, some challenges remained, such as the accurate tracking of swab utilisation and ensuring consistent survey responses.

Overall, while the study demonstrates promising results for the use of self-treatment stations in managing nausea in the ED, further research with more robust data collection is needed to improve the validity of these findings.

CONCLUSION

This study demonstrates the potential usefulness of self-treatment stations for managing nausea in the ED. The intervention provided a rapid, non-invasive and accessible treatment option that alleviated nausea symptoms for many patients, with more than half suggesting great or good improvement, and 88% suggesting slight improvement or more. The self-treatment stations also helped redirect the focus of nurses, supporting resource optimisation in the busy ED.

Despite the observed benefits, the sustainability of this approach requires careful consideration. Challenges such as ensuring accurate data collection, addressing potential misuse of the swabs and maintaining patient engagement through survey responses need to be addressed in future studies. Moving forward, adopting more robust data collection, along with regular engagement of staff, will be important for sustaining this intervention. These factors may be considered in the next phase of this project.

In summary, the implementation of self-treatment stations has the potential to be an effective approach for improving patient care in EDs. The findings suggest that this approach may enhance patient outcomes and ED

efficiency, contributing to more patient-centred emergency care.

Contributors All authors have made significant contributions to this paper. Authors 1, 2, and 3 wrote the study. Author 1 provided revisions to the manuscript. Author 4 conceptualised the study and provided supervision to authors 1 and 2. Author 5 coordinated data collection and analysis. All authors reviewed and approved the final manuscript and contributed to aspects of design, data collection, and analysis. Author 1 is the guarantor of this work. Scholar AI (ChatGPT-integrated solution) was used in assisting this submission. It was used to improve clarity and readability of the draft. A draft of data was inputted into the software in alignment with the SQUIRE guidelines. AI used this information to provide a more readable output. This output was closely revised to ensure accuracy of information, and modifications were made accordingly. AI was not used in any other process related to the research (e.g., data collection, analysis, literature review) outside of manuscript clarity support.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, conduct, reporting or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval Ethical approval was not required for this study because it was exempt by Fraser Health Authority based on the following statement: "QI projects within Fraser Health do not require formal ethical review or approval. While the Fraser Health Research Ethics Board (FHREB) does not review or approve QI studies, those leading projects should always have the approval of their relevant supervisor before proceeding." The authors can verify that approval from the relevant supervisor was obtained before proceeding. Consent was obtained from patients using the self-treatment station, with patient feedback collected anonymously to protect confidentiality. The study was a part of the Specialist Services Committee Physician Quality Improvement Program, and did not require review from a formal ethics board. Ethics approval was obtained by a supervisor prior to embarking on this project.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as supplementary information. There is no patient identifiable data, all data uploaded as part of study.

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