Postgraduate Diploma in General Pharmacy Practice

Audit or Service Evaluation
Written Task Coversheet

Please complete this coversheet and include as the first page of your written task.

Proposal title	Investigating the sustainable and effective use of inhalers
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Candidate number	
Date	01/03/2023

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- the title of your audit or service evaluation is in the header
- your candidate number, word count and the date are in the footer
- your name is NOT visible on any page except the cover sheet
- your data collection tool is included as an appendix

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Project Approval		
Project approved by:	Name (of individual or Board/Committee)	Date
Project supervisor	Richard Wilson	01/03/2023
Educational Programme Director	Eva Bayerkoehler	01/03/2023
Trust *(relevant Trust group)*	Imperial College Healthcare NHS Trust	01/03/2023
Ethics Committee (where appropriate)	N/A	N/A

Postgraduate Diploma in General Pharmacy Practice

Service Evaluation

Title: Investigating the sustainable and effective use of inhalers

Introduction

The National Health Service (NHS) in 2020 became the first healthcare system globally to commit to reducing carbon emissions it can control to net zero. This target was pledged in its campaign For a Greener NHS to be met by 2040 and would involve mitigating or offsetting carbon emissions (1). Inhalers have a significant impact on the environment, contributing approximately 3% of all NHS emissions, increasing to 13% in primary care (2).

A significant decrease in this figure could be afforded through a reduction in the use of pressurised metered dose inhalers (pMDIs). Data comparing European countries' usage of pMDIs suggests that there is significant room for an increase in the use of dry powder inhalers (DPIs) in the UK. Between 2006-2008, 70% of inhalers used within the UK were of the pMDI type. This was extraordinarily high in comparison to Sweden, where pMDIs accounted only for 13% (3), the lowest of the data available. One factor limiting the rollout of DPIs is the requirement for a more forceful inhalation than pMDIs. However, DPIs have been demonstrated to be suitable for the majority of patients with COPD or asthma, with the inspiratory flow requirement not being a limiting factor in most cases (4).

Investigating this area was important as the climate impact of pMDIs is underestimated by patients and healthcare professionals alike. A survey of 56 patients that use inhalers were asked to estimate the equivalent number of miles that a Ventolin Evohaler pMDI releases. The median result was 10 miles, whereas the actual figure was 176 miles (5). 60% of the participants indicated that they 'would' switch to a DPI inhaler, and a further 21% reported that they 'might'. This therefore indicates that there are both compelling reasons to switch patients to DPIs, and that patients are willing. This service evaluation sets out to determine whether these switches are happening in practice.

Context

The service evaluation was carried out on the acute medical wards of Imperial College Healthcare NHS Trust (ICHNT). Patients presenting with acute respiratory conditions would be initially triaged to these wards for management and hence this population was selected for the service evaluation. These patients are reviewed by the 'AIR team', respiratory clinical nurse specialists (CNS), or respiratory doctors. These specialists would review all aspects of the management of the patients' respiratory problems and suggest changes, including to their inhalers.

Purpose of the service evaluation

The purpose of this service evaluation was primarily to determine whether patients were being assessed for DPI suitability and then switched from pMDIs if appropriate.

Other outcomes are outlined in Table 1. Being a service evaluation, ICHNT did not have performance standards for these outcomes.

Table 1: Service evaluation outcomes

	Description of outcomes
Outcome 1	Patients have their inhaler technique reviewed during admission
Outcome 2	Eligible patients/devices are switched from pMDI to DPI
Outcome 3	Inhalers are prescribed correctly
Outcome 4	Patients are using their own inhalers from home

Method

Data was collected prospectively for all patients admitted to all the acute medical wards within ICHNT (Acute Medical Unit, Adult Assessment Unit, Emergency Medical Short Stay, Emergency Medical Admission, and Douglas side rooms 1-4). The combined capacity of these wards is 105 beds.

The Raosoft Sample Size Calculator recommended that a sample size of 92 would be the minimum number needed to obtain a confidence interval of 95% and a 10% margin of error (6). Due to operational capacity and to prevent data collection occurring over the Christmas period, where practice may not reflect the rest of the year, a limit of three weeks was applied to the data collection. Data collection did not occur at weekends due to staffing limitations. Data was collected by pharmacists who had encountered the patients through their routine practice in these areas. The details of the identified patients were recorded on a securely stored Excel data collection tool (Appendix 1).

A pilot study was carried out over two days to test the data collection method. The pilot identified that it was not routinely documented whether patients established on pMDIs were eligible to be switched to DPIs. Therefore, to assess outcome 2, only patients that were prescribed a combination of both pMDI and DPIs were included in this data. As this cohort was already established on a DPI, they would be eligible for their other devices to be switched to this type by default.

Following data collection, the figures were analysed using Microsoft Excel. The inclusion and exclusion criteria are detailed in Table 2.

Table 2: Inclusion and exclusion criteria of service evaluation

Inclusion criteria	Exclusion criteria
Patients admitted to acute medical wards at ICHNT	Patients whom data had already been collected during the service evaluation
Patients who were known to be prescribed inhalers for any respiratory conditions prior to admission	Patients that were not prescribed inhalers prior to admission
Patients where an acute worsening of any respiratory conditions had been the cause or confounding factor in their admission	Patients that were not admitted with exacerbations of respiratory conditions as they were unlikely to have their inhalers reviewed during admission
	Inhalers that were suspended as an inpatient were excluded from outcome 3
	Prescriptions for salbutamol pMDI inhalers were exempt from outcome 4 as it was not practical to determine if it was the patients' own, or from ward stock

Informed patient consent was not sought prior to data collection. As participation would have no impact on the personal information accessed, the patient's autonomy was therefore not affected (7). Because data was stored securely and anonymously, and as participation would have no effect on the level of care received, the ethical principles of non-maleficence and justice were also observed (7).

ICHNT policy is that ethics approval is waived for service evaluations.

Results

In total, 77 inhaler prescriptions for 39 patients were identified as being eligible for inclusion in this service evaluation over the three-week period. Of the 39 patients, 16 of them (41%) met outcome 1 by having clear documentation of inhaler technique review.

With regards to outcome 2, it was found that 12 of the 77 inhalers were eligible to be switched from pMDIs to DPIs. One (8%) of the 12 devices was switched to a DPI. This change was actioned because of the patient's preference for DPIs.

When reviewing the results for outcome 3, of the 77 prescriptions, it was found that six inhalers were not prescribed correctly (detailed in Table 3). The remaining 71 inhalers were transcribed in an appropriate manner (92%), with 43 'active' prescriptions, and 28 being intentionally suspended for clinical reasons.

Table 3: Summary of prescribing errors identified for outcome 3

Prescribing error	Number of prescriptions
Duplicate prescriptions of differing instructions	2
Prescription not 'unsuspended' when nebules ceased	2
Incorrect frequency of maintenance inhaler	1
Incorrect inhaler prescribed	1

Reviewing the 77 prescriptions for outcome 4, 34 were excluded for being ward stock items. A further 14 were excluded as the prescriptions were suspended for clinical reasons. Of the remaining 29 eligible prescriptions, 19 of the inhalers were ordered from the inpatient pharmacy, and 10 (34%) were the patient's own brought in from home. The total results are summarised in Table 4.

Table 4: Results of service evaluation

	Description of outcome	Result
Outcome 1	Patients have their inhaler technique reviewed during admission	41%
Outcome 2	Eligible devices are switched from pMDI to DPI	8%
Outcome 3	Inhalers are prescribed correctly	92%
Outcome 4	Patients are using their own inhalers from home	34%

Discussion

As a service evaluation, there are no standards to which these results may be compared. The lowest scoring result was outcome 2; where 8% of eligible pMDI devices were switched to a DPI. This demonstrates that significantly more could be done to reduce the 3% of emissions that inhaler usage contributes to the NHS's total. Further investigation into the reasons behind the low rate of change from pMDIs from DPIs is warranted.

One explanation is that patients may be reluctant to change from inhalers that they are familiar with. However, Klorman *et al.* in 2022 found that 70.5% of patients were unaware that common inhalers contain powerful greenhouse gasses (8). Once educated, 59% of the surveyed patients felt they would actively want to change inhalers, and 26% reported that they 'wouldn't mind'. This indicates that better education of patients would aid the switching from pMDIs to DPIs.

There is also significant room for improvement in outcome 4; patients using their own inhalers brought from home. This outcome differs from others in that it is assessing patients' behaviours as much as healthcare professionals'. If patients were better informed of the environmental impact of inhalers, it is possible that they would ensure their devices are brought into hospital. As well as patients, pharmacists also have a significant role in this outcome by scrutinising requests for inhaler supply.

The outcome for patients having their inhaler technique checked was based on the British Thoracic Society's and Scottish Intercollegiate Guidelines Network's guideline on the management of asthma, and NICE NG116 on COPD (9, 10). The result of 41% was lower than these organisations would expect in patients admitted with exacerbations of respiratory conditions. However, the limitation is that the low percentage may be due to a lack of documentation that the technique is being checked, rather than the absence of the test.

The highest performing was outcome 3; investigating whether inhalers were being prescribed correctly. The most common errors were related to electronic prescribing technique – duplicate orders and prescriptions not being unsuspended when patients' clinical situations changed.

One limitation of the service evaluation is that fewer patients than suggested by the confidence calculation were included. An additional limitation is due to the nature of acute medical wards and their rapid triage of patients to specialist areas. As this service evaluation only examined patients while in the acute medical wards, it is possible that patients were being switched to DPIs while on 'downstream' wards.

Clinicians were also not observed to document whether patients established on pMDIs were suitable to be switched to DPIs unless this change was being made. This reduced the accuracy of outcome 2, and the actual percentage of eligible devices switched to DPIs is likely to be lower.

In conclusion, based on the findings and limitations of the service evaluation, there is clear evidence that significant improvements can be made in some outcomes.

Recommendations

For the targets laid out in the Greener NHS campaign to be met by 2040 it will require change from across the organisation. This service evaluation has identified a way that ICHNT can contribute to these targets. By targeting to increase the 8% switch rate from pMDIs to DPIs this will have a significant impact on greenhouse emissions.

For changes to be made it will require involvement of additional stakeholders; educating both healthcare professionals and patients alike of the issue posed by pMDI inhalers. Educating patients on the environmental impact of inhalers could also improve adherence to outcome 4, where they are more likely to ensure that their own devices are brought in from home.

Within ICHNT, the AIR team, respiratory CNSs and respiratory medics are in the best position to champion the switch to DPIs. They routinely review patients admitted with exacerbation of airways disease and will check the patients' inhaler technique as part of this. Recruiting these teams to additionally screen patients for eligibility of DPIs is likely to

improve the outcome of future service evaluations/audits. Having all patients be screened for DPI eligibility will also increase performance in outcome 1; ensuring patients inhaler technique is checked and documented.

Due to the importance of this topic, and the room for improvement, a repeat of this service evaluation would be indicated once stakeholders are informed and a plan for change is actioned.

Feedback of findings

The findings were discussed in a meeting with the senior lead pharmacist for specialist medicines at ICHNT as well as the lead pharmacist for education and training and author of Pharmacy Green Plan. A further meeting will be arranged with additional stakeholders, where a presentation will be given by the author of this service evaluation.

Action Plan

Actions to be completed post service evaluation publication are summarised in Table 5.

Table 5: Action plan post service evaluation

Action to be taken	Actioned by	Target completion date
Consider organising meeting and discuss results with AIR team, respiratory CNSs, and respiratory medics. Negotiate ways in which stakeholders could contribute towards improving the Trust's contribution to Green NHS campaign.	Pharmacist completing service evaluation	01/04/2023
Discuss making official standards for sustainable inhaler use within ICHNT with specialist pharmacists so that the service evaluation results could be subsequently audited.	Pharmacist completing service evaluation	01/05/2023
Consider developing leaflet for patients, distributed by inpatient pharmacy with inhaler supply requests. The leaflet would detail how to safely dispose of inhalers and how to minimise environmental impact through avoiding wastage.	Pharmacist completing service evaluation	01/06/2023
Consider repeating service evaluation/audit having educated stakeholders and developed materials for patients.	Pharmacist completing quality improvement project	01/07/2023

Learning from your Audit/Service Evaluation

One issue identified with the prospective method of data collection was that patients may have been reviewed by specialist teams after their data had been recorded. For future investigations into this area it may be worthwhile for only the hospital number to be collected of eligible patients. The patients' full records could then be reviewed once discharged.

One strength of the service evaluation is that the data was collected by a large group of pharmacists, enabling a larger cohort of patients. Having data collected in real time was also less work for the pharmacists involved as it could be done in real time.

Some advice to others attempting a similar service evaluation would be to consider having a single healthcare professional collect and record data retrospectively. Eligible patients could still be identified by several individuals, but completion of the form by a single person would help to ensure that the information is recorded in a consistent way.

This service evaluation has established a baseline performance of current practice which may be used as a marker for future audits. It has also highlighted areas where there is room for improvement, aiding ICHNT to work towards meeting the targets laid out in the NHS' pledge to deliver 'net zero' by 2040.

References

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Appendix 1 : Data collection tool

	Date	MRN	Presenting complaint	Respiratory condtion - Asthma/COPD/ILD/Other	Inhaler device	Inhaler class (See table 1)	Prescribed correctly	Inhaler supply	Inhaler technique reviewed during admission?	Is the patient eligible for a DPI	Was the patient changed to a DPI?
1											
2											
3											
4											
5											

Red (MDI)
Amber (MDI)
Green (DPI)

Table 1: Inhaler classifications by carbon footprint

Carbon Footprint (kgCO2e per inhaler)	Inhaled Corticosteroid (ICS) containing inhalers			Non-ICS containing inhalers			
	ICS	ICS/LABA	ICS/LABA/LAMA	SABA OR SAMA	LABA	LAMA	LAMA/ LABA
Highest (>35 kgCO2e) Avoid unless no appropriate alternative		Flutiform pMDI & K-haler Symbicort pMDI		Ventolin Evohaler			
High (10-20 kgCO2e) Use only if low carbon footprint alternative not clinically appropriate	Clenil Modulite Kelhale Qvar Autohaler Qvar EasiBreathe Soprobec Alvesco Flixotide Evohaler	Fostair pMDI Seretide Evohaler Combisal AirFluSal pMDI Sirdupla Aloflute Sereflo	Trimbow pMDI Trixeo	Airomir AirSal Salamol Airomir Autohaler Salamol Easibreathe Atrovent	Serevent Evohaler Soltel Neovent Vertine Atimos Modulite		Bevespi
Low (<1kg CO2e) Use where possible	Beclometasone Easyhaler Budesonide Easyhaler Pulmicort Turbohaler Budelin Novolizer Flixotide Accuhaler Asmanex Twisthaler	Fostair Nexthaler Duoresp Spiromax Fobumix Easyhaler Symbicort Turbohaler Seretide Accuhaler Fusacomb Easyhaler Aerivio Spiromax AirFluSal Forspiro Stalpex Orbicel Fixkoh Airmaster Relvar Ellipta	Trelegy Trimbow Nexthaler	Salbutamol Easyhaler Salbulin Novolizer Ventolin Accuhaler Bricanyl	Foradil Formoterol Easyhaler Oxis Onbrez Striverdi Serevent Accuhaler	Spiriva Handihaler Spiriva Respimat Braltus Zonda Tiogiva Acopair NeumoHaler Incruse	Spiolto Ultibro Duaklir Anoro