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Corresponding author:
David Price; Email: dprice@opri.sg

David M.G. Halpin and James Gatenby both contributed equally to this work.

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Implementing quality improvement for patients with high-risk chronic disease: lessons from the CONQUEST UK COPD programme

David M.G. Halpin[1,2], James Gatenby[3], Katherine Hickman[4,5,6], John Hurst[7], Amy Couper[2,3], Andrew P. Dickens[2], Alexander Evans[2], Alejandro Adan Coronado[3], Rachel Pullen[2], Luís Alves[8,9], Mona Bafadhel[10], Victoria Carter[3], Michael Crooks[11], Marc Miravitlles[12], Tamsin Morris[13], Hana Müllerová[13], Mukesh Singh[14], Jennifer K. Quint[15], Dave Singh[16], Tom Wilkinson[17,18], Tonya Winders[19] and David Price[2,3,20]

[1]University of Exeter, UK; [2]Observational and Pragmatic Research Institute, Singapore; [3]Optimum Patient Care Global, UK; [4]RCP London: Royal College of Physicians, UK; [5]Low Moor Medical Practice, Bradford, UK; [6]West Yorkshire ICB, UK; [7]University College London, UK; [8]University of Porto: Universidade Do Porto, Portugal; [9]Laboratory for Integrative and Translational Research in Population Health (ITR), Porto, Portugal; [10]King's College London, UK; [11]University of Hull, UK; [12]Vall d'Hebron Institut de Recerca, Spain; [13]AstraZeneca UK Limited, UK; [14]Keele University, UK; [15]Imperial College London, UK; [16]Manchester University NHS Foundation Trust, UK; [17]NIHR Southampton BRC Southampton, Southampton, UK; [18]University of Southampton, UK; [19]Global Allergy & Airways Patient Platform, Austria and [20]University of Aberdeen, UK

Abstract

Large-scale quality improvement programmes (QIPs) have diverse factors that may influence their success and can undergo rapid changes throughout their lifecycle. The COllaboratioN on QUality improvement initiative for achieving Excellence in STandards of COPD care (CONQUEST) programme has recently been implemented in primary care practices in the UK. The CONQUEST programme aims to identify patients with already diagnosed and undiagnosed COPD at high risk of COPD-related adverse outcomes and optimize their management. CONQUEST has been successful in identifying COPD patients who may represent an outsized opportunity to improve patient outcomes and healthcare utilization, whilst focusing on relatively few patients per primary care practice. This paper reviews the steps involved in implementing CONQUEST in the UK, focussing on the challenges encountered, the solutions used to overcome these challenges barriers, and the lessons learned for the implementation of QIPs more widely. Key lessons from this process include that QIPs need to be designed with the flexibility to adapt to multiple and different local contexts, that early monitoring of data across the lifecycle of a QIP allows efficient detection of issues and troubleshooting, and that planning for allocation of limited resources to a QIP is essential for real-world implementation. The problems and solutions described here are applicable to QIPs in a wide variety of high-risk diseases and different healthcare settings.

Introduction

Chronic obstructive pulmonary disease (COPD) remains a leading cause of morbidity and mortality worldwide, and there is increasing evidence for the link between exacerbations of COPD and cardiovascular events (Hurst *et al.*, 2024). Effective pharmacological and non-pharmacological treatments are available (Agustí *et al.*, 2023), and there is evidence-based guidance on the management of COPD (National Institute for Health and Care Excellence, 2018; Agustí *et al.*, 2023), yet management is often sub-optimal (Halpin, 2023). For example, although COPD remains one of the most common reasons for emergency hospital admission in the United Kingdom (UK) (National Institute for Health and Care Excellence, 2018), in one study, one third of patients hospitalized for an exacerbation of their symptoms had not been reviewed in a primary care COPD clinic during the previous 12 months (Buckingham *et al.*, 2008). Sub-optimal management of patients with COPD, in terms of clinic review and pharmacological and non-pharmacological treatment, is associated with increased risk of exacerbations, increased lung function decline, and increased healthcare costs (Halpin *et al.*, 2017; Kunisaki *et al.*, 2018; Zheng *et al.*, 2018; Kerkhof *et al.*, 2020).

Health services, including the National Health Service (NHS) in England, are moving towards a population health management (PHM) approach, which aims to improve health through data-driven planning and the delivery of proactive care to optimize health outcomes

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Table 1. Key terms (adapted from Pullen *et al.* 2021)

Term	Definition
Target population for CONQUEST	
Patient with modifiable high-risk Chronic Obstructive Pulmonary Disease (COPD)	Patients with COPD (either already diagnosed or as yet undiagnosed) who have experienced ≥2 moderate, or ≥1 severe exacerbations in the last 24 months (with at least one exacerbation occurring in the last 12 months), AND whose medical record data indicates clearly that there is scope for management optimization.
Patients with scope for management optimization	Patients who continue to exacerbate while on their current therapy (including no therapy, SABA, SAMA, or SABA/SAMA only) and/or whose management may be optimized by correct diagnosis, or additional pharmacological and non-pharmacological interventions.
Already diagnosed patients with modifiable high-risk COPD	Patients with an existing COPD diagnosis who fit the modifiable high-risk criteria with respect to recent COPD exacerbations and are ≥40 years of age.
Undiagnosed patients with potential modifiable high-risk COPD	Patients without a COPD diagnosis who fit the modifiable high-risk criteria with respect to recent exacerbations of undiagnosed COPD, and who are smokers or former smokers ≥40 years of age.
Newly diagnosed patients with modifiable high-risk COPD	A subset of the above undiagnosed patients who receive a COPD diagnosis following diagnostic assessment.
Exacerbations	
COPD exacerbation	A significant worsening in respiratory symptoms in people with COPD (or an event analogous to a COPD exacerbation in people with suspected but undiagnosed COPD), categorized as moderate or severe (see below) using validated code lists.
Moderate exacerbation	Requiring an acute course of systemic corticosteroids and/or a course of antibiotics within 3 days of a lower respiratory consultation indicative of a probable COPD exacerbation, or an emergency room visit for a COPD-related cause.*
Severe exacerbation	An exacerbation resulting in a hospital admission.*

*Identified using validated code lists for moderate and severe COPD exacerbations.
CONQUEST: COllaboratioN on QUality improvement initiative for achieving Excellence in STandards of COPD care; SABA: short-acting beta-agonist; SAMA: short-acting muscarinic antagonist.

(NHS England, 2024b). PHM aims to reduce the risk of hospitalization and address inequalities. Given the limited resources in primary care, successful implementation of PHM will depend on identifying and targeting those patients at greatest risk.

Many patients with COPD are susceptible to future exacerbations and could benefit from improved management including regular reviews, advice regarding medication, smoking cessation, vaccinations, and clinically appropriate therapies (Hurst *et al.*, 2010; Halpin *et al.*, 2019; Fekete *et al.*, 2020; Palli *et al.*, 2021). Patients with a history of exacerbations or comorbidities have a greater risk of future exacerbations and adverse cardiovascular events (Vanfleteren *et al.*, 2023; Halpin *et al.*, 2024; Hurst *et al.*, 2024; Wallström *et al.*, 2024). Patients who are at higher risk of exacerbations but are sub-optimally managed represent a 'modifiable high-risk' (MHR; see Table 1 for full description) group, as there may be scope to optimize management of these patients through additional pharmacological and non-pharmacological interventions. The group comprises patients with diagnosed COPD, but also those with the symptoms of COPD but not yet diagnosed, who also experience events identical to COPD exacerbations and are at increased risk of future events (Halpin *et al.*, 2024). To reduce the burden of the disease, early identification, assessment, treatment, and follow-up of these patients are a high priority. In many practices, the number of such patients will not be large, but they are likely to utilize a disproportionate amount of resource. For example, in Southampton 6% of COPD patients had ≥3 hospital admissions in the previous year and accounted for 22% of total COPD admissions (Wilkinson *et al.*, 2014).

The COllaboratioN on QUality improvement (QI) initiative for achieving Excellence in STandards of COPD care (CONQUEST) programme was developed to address this problem. CONQUEST comprises an interventional registry and integrated quality improvement programme (QIP). The interventional registry includes primary and secondary care MHR patients, whose anonymized data are collected from electronic health records (EHRs), questionnaires, and clinical assessments. The QIP is underpinned by four quality standards (Pullen *et al.*, 2021) and integrated clinical decision support (CDS) (Alves *et al.*, 2022) to provide relevant assessment and management considerations for care. The CONQUEST quality standards aim to improve the management of patients with COPD through accurate and timely diagnosis, holistic disease assessment, quantification of future risk of exacerbations and cardiac events, appropriate non-pharmacological and pharmacological interventions, and regular follow-up.

Previous work has quantified how current UK management of high-risk patients compares to the CONQUEST quality standards and has shown opportunities for improvement (Halpin *et al.*, 2023). For example, in 2019 over 40% of newly diagnosed patients had not had spirometry recorded in the previous year, and 39% of patients with an existing COPD diagnosis had not had their exacerbation history reviewed in the same period. The current situation is likely to be much worse as spirometry was suspended during the COVID-19 pandemic, and there are still wide variations in availability and use in the UK (Joo *et al.*, 2008; Howard, 2023).

Implementing QIPs, including those for COPD, across whole health systems such as primary care presents challenges and often leads to only modest improvements in outcomes (Lau *et al.*, 2015; Licskai *et al.*, 2024). Hard-to-reach populations, such as non-English speakers, those from more deprived backgrounds, and those with poor health behaviours, tend not to engage in QIPs (Flanagan and Hancock, 2010; Walters *et al.*, 2017); therefore, implementation of QIPs may result in greater health inequalities,

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as those who participate and benefit are those who already have an advantage. Identifying ways of encouraging the participation of those with the most to gain is a key challenge for implementation of QIPs in diverse populations. Successful implementation of QIPs depends on using strategies that have been designed to manage known challenges in the setting.

In this article, we discuss the practical barriers encountered, the solutions identified, and the lessons learned during implementation of the CONQUEST QIP. Although the QIP was implemented in primary care practices in the UK, the underlying principles and the approaches to overcoming practical issues of implementation are relevant to the management of other chronic conditions and could readily be applied in other countries and healthcare settings.

CONQUEST quality improvement programme implementation

Quality improvement programme and clinical decision support design

The CONQUEST QIP was implemented within participating primary care systems in the UK, guided by scientific and clinical input from the CONQUEST UK National Steering Committee. Implementation of the QIP involved nine steps: i) recruiting practices, ii) acquisition of the data needed for QI, iii) data processing, iv) identifying the MHR patients, v) delivering CONQUEST questionnaires to the MHR patients, vi) spirometry for undiagnosed populations, vii) assessment of newly and already diagnosed MHR patients with COPD, viii) institution of appropriate non-pharmacological and pharmacological interventions, and ix) appropriate follow-up.

Each of these steps is described below, in terms of the practical barriers encountered, the solution developed and the lessons learned. For ease of reference, a summary is provided in Table 2.

Recruiting practices

Practical barriers

Capturing the attention of primary care practices and communicating the benefits of a QIP is challenging, largely due to the pressures of a high workload and limited resources within UK primary care (Marshall and Ikpoh, 2022; Jackson *et al.*, 2025). Furthermore, once practices agreed to engage, local geographical areas had differing governance and technical requirements regarding installation of the software required for the QIP.

Solution

To increase the chances of practices being receptive to our approach, two main strategies were adopted. Several clinical and research leads from the CONQUEST UK national steering committee had close ties to practices in their local health areas and were able to directly engage practices to promote the QIP. Second, NHS Local Clinical Research Networks provided a central point of contact for reaching practices that would be interested in carrying out a QIP aligned with research. Similarly, Optimum Patient Care (OPC) was also able to promote the QIP within the OPC network (an established network of practices that engage with other QI activities provided by OPC). In addition to the described strategies, practices were contacted directly with phone and email campaigns if they were located in the geographical areas where the QIP was being implemented.

To encourage engagement with CONQUEST UK, there was clear communication to primary care practices of the likely benefits from participation. These included improved patient health outcomes, fewer patient consultations, and financial benefits. It was explained to practices that as patients with MHR COPD have increased risk of future exacerbations and cardiovascular events, optimizing their management is likely to reduce exacerbations and healthcare utilization. It was also explained how components of the QIP related to performance indicators in the Quality Outcomes Framework (a financial incentive programme within the UK primary care system that measures performance against specific indicators), assuring receipt of the associated financial incentives. The provision of support to practices including administrative assistance and staff to conduct QIP activities helped offset potential concerns about workload implications for the practice.

Liaisons with governance teams in each geographical area helped explore and address local requirements concerning the use of QIP-related software at each practice. Local processes varied regarding review, installation, and testing of the software for the QIP, and on-site and remote help was provided by OPC to address any challenges in implementing the software.

Lessons learned

Using established connections and networks within the primary care setting appeared to be an effective way of contacting practices. This would likely be an effective way for a health system to implement a QIP across practices.

Targeting practices known to be interested either in broad QI initiatives, or the clinical area of relevance to a specific QI programme, may result in higher uptake rates compared to approaching practices at random. Locally or nationally available data could be used to identify practices with high prevalence of the relevant disease. To further maximize practice engagement in QIPs, careful thought should be given to how the workload and potential benefits are presented and there should be clarity about what help is available to support implementation.

Liaising with local governance teams was crucial to ensure the successful implementation of the QIP. Early and ongoing contact allowed operational processes to be planned and adapted as local conditions shifted throughout the rollout of the QIP.

Acquisition of the data needed for quality improvement

Practical barriers

The QIP required patient-level EHR data to be extracted from practices into the Optimum Patient Care Research Database, via bespoke software to identify MHR patients. Operationalizing the QIP across multiple geographic localities required implementation in various local IT environments, using different software and with different infrastructures and data policies. Notwithstanding the variation between localities, interruptions to data transfer were experienced due to data policies being revised over time, as well as practices turning off or replacing the computer with the data extraction software installed.

Solution

Experience was gained by focusing initially on a small number of geographic areas, with only two different IT environments, allowing the OPC team to understand the different requirements and tailor their approach accordingly. Once the initial practices had signed data use agreements, the OPC team liaised with the NHS IT providers to explore potential issues regarding software compatibility. This led to varying approaches to suit each locality, with QIP-specific data extraction software being installed either on

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Table 2. Summary of CONQUEST UK QIP practical barriers, solutions, and lessons

Process	Practical barriers	Solutions implemented in CONQUEST UK	Lessons learned
Recruiting practices	Capturing attention of primary care practices	• Contacted primary care practices through multiple channels: 1. Clinical & research leads from the CONQUEST UK committee directly engaged with practices within their local areas. 2. NHS Local Clinical Research Networks & OPC's research and quality improvement network provided centralized points of contact for multiple practices. 3. Direct email and phone campaigns targeted practices within relevant geographical areas.	• Engaging through clinical and research leaders allows an established network to be quickly incorporated into the roll out of a Quality Improvement Programme (QIP). • Implementing a QIP in limited geographic areas can allow initial troubleshooting before roll-out to a wider geographical area.
	Variation in local processes, including governance sign off	• Initially implemented the QIP in small number of geographical areas, allowing for initial troubleshooting of the programme before opening the programme to wider participation.	
	Incentivising primary care practice involvement	• Highlighted burden of unrecognised Modifiable High-risk (MHR) COPD and the opportunity for improving patient outcomes/healthcare utilization. • Promoted QIP-related tasks that would reduce practice workload and earn funding via the Quality Outcomes Framework. • Provided administrative assistance to help overcome limits in staff capacity. • Financial and altruistic incentives for participation in QIP aligned research.	• Primary care practice involvement can be encouraged by demonstrating the added value of a programme, compared to the work required from them. • QIPs are more effective at changing practice when goals are aligned with financial incentives (Hurst *et al.*, 2020). • Supplied informational material should be easily digestible and highlight the QIP's ability to support clinicians with their workload.
Acquisition of the data needed for Quality Improvement (QI)	Installing software, and gaining approval and access for data extraction	• Collaborated with local IT providers and governance and data protection teams to solve local technical issues. • Installed software on regionally hosted servers or individual GP practice computers, as appropriate for each locality.	• QIPs should anticipate differences in data access between local areas and have resources allocated to resolving issues. • Aim to involve IT providers early in the process, to explain requirements, overcome blocks and minimize delays.
	Changes to some local IT environments interrupted ongoing data delivery throughout the QIP	• Monitored data extractions across practices and liaised with data extraction services and practices to resume data collection and recoup missed data quickly.	• QIPs should closely monitor the flow of data throughout the programme and be able to react quickly to issues that impede this process.
Data processing	Standardizing patient data collected between Electronic Health Records (EHR)	• The CONQUEST Database was structured according to the Observational Medical Outcomes Partnership (OMOP) Common Data Model, to standardise the structure and content of health data extracted from different clinical systems.	• Clinical data management plans should be developed early in QIP implementation timelines. • Transforming data into a common format at the outset facilitates consistency of data elements, and more efficient data analysis and data sharing.
Identifying Modifiable High-risk (MHR) patients	Accurately identifying possible exacerbation events at scale	• An EHR-based algorithm was built to automatically flag possible COPD exacerbations using a hierarchy of specific exacerbation/hospitalization codes, and prescriptions/admissions with/without associated respiratory codes. • False positives in this algorithm were subsequently reduced through the review of possible exacerbations by medically trained personnel. • All exacerbation events were initially reviewed, with patient identification becoming largely automated during the QIP due to iterative algorithm refinement. • To increase certainty in the algorithm, patient exacerbations in the last year were verified over the phone.	• NHS providers including Integrated Care Boards could analyse EHR data themselves or contract external partners to identify patients with possible MHR COPD or other high priority diseases. • EHR systems or tools can flag these potential high-risk patients automatically using a validated algorithm. • There is the potential for increasingly advanced AI tools to improve this process and reduce the need for manual overread.
	Identifying patients who do not proactively engage with healthcare systems	• The CONQUEST algorithm was built to automatically identify potential high-risk patients without them needing to seek further diagnosis or treatment for their exacerbations or symptoms.	• For QIPs to reach patients that do not proactively seek increased healthcare, targeting patients based on EHR data is one strategy.
	Number of identified MHR patients exceeded capacity of the CONQUEST QIP	• Patient prioritization focused on those most likely to benefit from intervention.	• Adopt a staggered approach to implementation, focusing on highest priority patients initially, and later engage subsequent patient groups as capacity allows.

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Table 2. (*Continued*)

Obtaining CONQUEST questionnaire data from the MHR patients	Low response rate to questionnaires sent via text with some questionnaire items missing	• Multiple methods used to maximize response rates and data completion: 1. Patients were called to complete questionnaires over the phone, with clinically trained staff where possible. Multiple calls were made over different days and time of day to enhance reach. 2. Undiagnosed patients were also asked to complete questionnaires at the time of spirometry.	• At scale, several methods to enhance questionnaire completion may be required. For example: 1. Electronic distribution via official healthcare system apps or websites. 2. Sending questionnaire links via text from practice registered numbers that connect via cloud-based system to the EHR.
	Patient mistrust of phone numbers from outside their primary care practice	• Used the practice's own cloud telephone systems where possible to reach patients.	• QIPs should plan, where possible, to enter collected data back into EHRs. • Automated access to this data eases administrative burden for healthcare providers and enhances data for future patient care.
Spirometry for undiagnosed patients	Lack of internal practice resources for spirometry provision and interpretation	• Engaged accredited external respiratory physiology provider with trained staff. • Liaised with primary care practices to arrange spirometry clinics at their venue, utilizing external staff and equipment. • Spirometry interpretation conducted by external respiratory physiologist and specialist respiratory physician.	• 'Hub and spoke' models of diagnostic testing such as 'Community Diagnostic Centres' may overcome resource challenges, e.g. long waiting lists, or insufficient patients to justify a single clinic. • Ability to offer diagnostic clinics at a patient's home practice would still be valuable, particularly for those who do not wish/are not able to travel to other locations for testing.
	Conducting spirometry clinics at smaller practices Patient reluctance to travel to locations other than their home practice for testing	• Targeted larger primary care practices throughout implementation, shifting focus towards practices with at least 15,000 patients.	
	Identification of patients unsuitable for spirometry	• Primary care practices were given the chance to screen out patients identified as a candidate for a spirometry clinic based on local knowledge of the patients' history and suitability for spirometry.	• Active practice involvement in the case finding process for a QIP can make the best use of limited resource by helping prioritize patients.
	Non-attendance for spirometry appointments	• Where possible, patients were both texted and called the day before to remind them about their upcoming spirometry appointment.	• While appointment reminders are resource intensive, it may improve attendance rates.
	Treatment of patients that did not receive a COPD diagnosis following spirometry	• The respiratory physician sent a plan for review, investigation and treatment of these patients to their primary care team. • Ongoing administrative support for carrying out this plan was provided.	• QIPs should anticipate appropriate care pathways for all patients that participate in the programme.
Assessment of newly and already diagnosed MHR patients and institution of appropriate treatment	Variation in clinical workflows and referral pathways in local practice systems Lack of GP practice resources to carry out all CONQUEST review activities	• Clinical Decision Support (CDS) package was refined over time to cover all key assessment areas efficiently and simply. • Data from the undiagnosed patient spirometry clinics were remotely reviewed by a respiratory physician, who diagnosed COPD according to clinical guidelines and provided a recommended treatment plan. • Newly and already diagnosed patients with MHR COPD received a telephone-based pharmacist clinic. The pharmacists were provided with the CONQUEST CDS to standardize assessment and treatment options in line with best practice guidelines.	• Thought is needed to identify how to facilitate clinical activities in QIPs where external resources may not be available. • Integrate local checklists and workflows adapted from best practice guidelines and resources to ensure standardization and local relevance.
Appropriate follow-up	Allocation of resources for follow-up reviews	• Patient follow-up was prioritized according to patient-reported COPD disease status and opportunities for further intervention within the specifications of the CDS.	• QIPs have a large scope for continuing to review patients and provide further intervention, but this can be constrained by limited resources.
	MHR patients that received the QIP but did not receive recommended treatment plans	• EHR monitoring identified patients not receiving the proposed treatment plans, with further reviews facilitated as appropriate.	• NHS providers could analyse EHR data to detect patterns of non-implemented treatment recommendations, to identify system-level barriers that may exist.

CONQUEST: COllaboratioN on QUality improvement initiative for achieving Excellence in STandards of COPD care; COPD: Chronic Obstructive Pulmonary Disease; CDS: Clinical Decision Support; EHR: Electronic Health Record; IT: Information Technology; MHR: Modifiable High-risk; NHS: National Health Service; OPC: Optimum Patient Care; QIP: Quality Improvement Programme.

servers hosted by the regional IT provider or on individual practices' computers, to maximize software compatibility.

Monitoring the flow of data received from engaged practices enabled the OPC team to detect interruptions due to unanticipated changes in local IT environments over the course of QIP implementation. The team was then able to work with IT providers to make amendments to resume data collection.

Lessons learned

Implementing the QIP in a small number of practices and localities before expanding to other areas enabled the OPC team to identify and address problems in a manageable way. Once the initial operationalization of the QIP was completed, it was easier to anticipate and avoid challenges when rolling out to different areas or contexts.

Liaising with local IT providers helped the OPC team understand the requirements of different localities, so that modifications could be made before the QIP was implemented. Fostering good working relations with IT providers and monitoring data flows may enable unanticipated barriers to be overcome more quickly, and minimize disruption to data transfer.

Data processing

Practical barriers

To enable the CONQUEST QIP to be implemented in all practices, it was essential for the interventional registry to collect and store data from general practice EHRs extracted from the different clinical systems used in primary care (SystmOne, EMIS, Vision). Although each system uses the same clinical terminology (SNOMED CT) for its coding, the data are stored differently, hence data cannot be directly compared between systems.

Solution

The data management plan for the CONQUEST UK interventional registry specified a standardized structure according to the Observational Medical Outcomes Partnership (OMOP) Common Data Model. OMOP was created to allow analysis of data from different clinical systems.

Lessons learned

Mapping EHR data into an OMOP structure allowed standardized interpretation of patients' EHR data, regardless of the source clinical system. Data standardization was essential to support the implementation of the QIP across all practices.

Identifying modifiable high-risk patients

Practical barriers

Patient eligibility for the CONQUEST UK programme was based on EHR-recorded data on age, COPD diagnosis, or potential undiagnosed COPD, and MHR status. Patients were deemed to meet MHR criteria according to exacerbation history and scope for management optimization (Table 1). The OPC team needed to verify that patients met this definition prior to participating in the CONQUEST UK programme.

Solution

To identify patients meeting the CONQUEST UK eligibility criteria, OPC developed an EHR-based algorithm to detect recorded evidence of clinical events that were highly likely to correspond to exacerbations of COPD. Initially, potential exacerbations recorded in the EHR were manually reviewed by a clinician to verify patients' MHR status. Manual review was a robust but resource-intensive method, which was later replaced with verifying exacerbation history with patients during the first phone contact. Common reasons for false positive identification of MHR patients detected through the reviewing and verification processes, and broader quality checking, were used iteratively to improve the accuracy of the EHR-based algorithm over time. The algorithm used EHR codes conforming to the standardized OMOP model, permitting its use across all practices, irrespective of the clinical system.

CONQUEST UK identified more potential undiagnosed COPD patients than could be reviewed within the resources of the programme. Patients with the greatest scope for benefit were prioritized. The highest priority was given to patients not on any inhaled therapy, those on monotherapy with a long-acting beta-agonist (LABA) or long-acting muscarinic antagonist (LAMA), and those with a blood eosinophil count $\geq$300 cells/μl who were not on inhaled corticosteroids (ICS) maintenance therapy.

Lessons learned

Developing an EHR-based algorithm that could be iteratively modified over time was an efficient means of identifying potentially eligible patients while minimizing the number of inappropriate patients needing to be contacted. Data recorded in EHR can be used to identify patients with specific clinical characteristics, either via bespoke searches in individual general practice clinical systems or standardized algorithms applied across multiple healthcare providers.

Searching for patients automatically in an EHR system may have enabled the CONQUEST UK programme to target patients who would not have sought, or realized they needed, clinical review and better treatment. Identifying patients proactively via EHR algorithms, rather than opportunistically when patients contact healthcare settings, may overcome the risk of worsening health disparities caused by only reaching those who are more actively engaged with their health care.

Prioritizing patients at greatest risk of future respiratory or cardiac events, such as those on minimal inhaled therapy, was a pragmatic way of delivering the programme within the available resources. Although this criterion was specific to COPD, QIPs in other disease areas could similarly prioritize patients at greatest risk where capacity is limited.

Obtaining CONQUEST questionnaire data from the MHR patients

Practical barriers

The collection of patient-reported outcomes was essential for both confirmation of patient eligibility and disease assessment. Questionnaires were the most efficient method of collecting data from large numbers of patients, though they posed challenges in terms of cost, response rates, and data completion.

Solution

When the QIP was first implemented in a practice, patient questionnaires were delivered via text message, representing substantial cost savings compared to questionnaires sent via post. The text message included the customized sender ID that practices used for other texts, indicating it was a genuine message sent on behalf of the patient's practice. There was a poor response rate (17.5%) to these text-based questionnaires and data quality checks revealed that some questionnaires were only partially complete. To address both issues, the questionnaires were instead administered

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by OPC staff, either face-to-face with undiagnosed potential COPD patients attending spirometry appointments (described in following section) or by telephone with all remaining eligible patients. Clinically trained staff administered the questionnaires wherever possible, to minimize incorrect interpretation of question items by patients.

Patients completing questionnaires sent by text message alone, without requiring follow-up by phone or in person, may have been those who were more engaged in the healthcare system. To extend the reach of the programme, calls to non-responding patients to complete questionnaires were made on multiple days and at different times, to maximize the representativeness of patients providing questionnaire data.

Lessons learned

Using multiple modes of administration maximized the number of questionnaire responses received, including from patients who may not otherwise interact with healthcare via clinics or correspondence. Other solutions for capturing this data in the future may include distribution via official healthcare system apps/websites or sending questionnaires via practice registered phone numbers where systems allow this.

Spirometry for undiagnosed patients

Practical barriers

Spirometry is required to confirm the diagnosis of COPD in patients with respiratory symptoms and a relevant clinical history. Detecting new COPD diagnoses was a fundamental component of the CONQUEST UK QIP, but many practices in the UK lack the equipment, trained staff, time, and financial incentives to provide spirometry (Primary Care Respiratory Society, 2023). The NHS is currently implementing Community Diagnostic Centres (NHS England, 2024a), representing 'hub-and-spoke' models for a wide range of diagnostic testing, often including spirometry. However, accessibility issues at some of these services (Healthwatch England, 2024) highlights the need for continued provision of spirometry at local practices to maximize service coverage and accessibility.

Spirometry clinics provided as part of the QIP needed to maximize the number of patients booked to be cost effective. Challenges encountered during the delivery of spirometry clinics included patient attendance rates, yield of new COPD diagnoses, practices with small patient list sizes, and follow-up for patients not diagnosed after the clinic visit.

Screening calls were conducted with patients about one week before the spirometry clinic date, and eligible patients who agreed to attend the clinic were given an appointment time. Initial clinics had a non-attendance rate of 25%, often due to patients forgetting or having conflicting commitments. Amongst patients attending the initial clinics, the proportion subsequently diagnosed with COPD (the yield) was low, resulting in fewer newly diagnosed patients receiving the QIP than anticipated in some practices.

Based on one physiologist and one administrator attending each clinic, a full clinic had up to 18 patients per day, allowing sufficient time for required physiological tests and questionnaire completion. Some clinics were conducted with notably fewer patients, for instance if low number of undiagnosed potential MHR patients were identified at smaller practices. All scheduled clinics were conducted, regardless of whether all appointment slots were filled. Plans for a hub-and-spoke model, with patients from nearby small practices attending a spirometry clinic at a central practice, were not implemented due to patients' reluctance to attend other practices and, practices being unable to host patients from other general practice registers.

Solution

To overcome the lack of spirometry clinics at many practices, OPC provided all required resources, including administrative support to schedule patients and an external spirometry service with accredited staff, equipment, and interpretation of the results by clinicians. Practices only needed to provide a clinical room for the spirometry clinic.

To optimize the use of resources and ensure fully booked spirometry clinics, larger practices were recruited to increase the pool of potentially eligible patients. Practices with ≥15,000 registered patients typically enabled at least one fully booked spirometry clinic to proceed.

To improve the clinic attendance rate, patient reminders were introduced in the form of a text message and a phone call the day before the clinic visit to confirm availability. If patients could no longer attend, patients from a waiting list were booked when possible. The implemented reminders increased attendance rates from 74.6% to 85.5%.

Several actions were taken to improve the yield of new COPD diagnoses from spirometry clinics. As described above, the specificity of the EHR-based algorithm was improved over time, informed by the exacerbation verification conducted during the first phone contact with patients, as well as characterization of patients receiving new diagnoses. At practices with many patients eligible for spirometry, priority was given to those with the greatest likelihood of COPD diagnosis according to their clinical history, based on EHR and questionnaire data. These actions increased the yield of new COPD diagnoses from 21.7% to 48.2% of patients attending the first eight and last eight spirometry clinics, respectively.

Practices were invited to screen out patients based on their history and suitability for spirometry. Practice involvement in this process varied depending on available resources.

For patients not diagnosed with COPD following spirometry, a respiratory physician sent a letter to their practice, suggesting further assessment, investigation, and management that could be considered to investigate the cause of the patient's symptoms. Administrative support was given for the follow up of these patients.

Lessons learned

Providing practices with additional resources was essential to successfully implement the QIP in UK general practice. Similar programmes may require fewer additional resources in future, if Community Diagnostic Centres become widespread and are able to support QIPs. Where spirometry is available at these centres, they could potentially integrate patient identification and prioritization for spirometry services based on the CONQUEST model, to improve the diagnostic yield. The ability for these centres to see patients from multiple smaller practices may improve the cost-effectiveness of spirometry testing; however, they would not overcome patients' reluctance to travel. The CONQUEST UK QIP shows that practice-based services are well received and effective at identifying MHR COPD patients.

Implementing the QIP in practices with large patient list sizes enabled all spirometry clinic appointments to be filled, maximizing the number of patients assessed. Determining a minimum practice list size required for future QIPs may vary based on their local

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context and efforts should be made to adapt programmes such that they are able to effectively cover smaller practices.

Sending patient reminders about booked appointments substantially improved clinic attendance rates. Although the reminders required extra resources, this must be balanced against the high cost of patient non-attendance in the provision of QIPs.

By treating the QIP as an iterative process, it was possible to modify processes over time that improved the yield of new COPD diagnoses. Monitoring process data throughout the lifetime of a QIP allows adjustments to be made as required, ensuring maximum benefit for the practices and patients involved.

Assessment of newly and already diagnosed MHR COPD patients and institution of appropriate treatment

Practical barriers

In practices with ≥15,000 registered patients, between 8–14 MHR patients were identified, with approximately one third being newly diagnosed via the QIP spirometry clinics. The CONQUEST UK QIP aimed to standardize patient reviews where possible, as outlined in the CDS package. OPC provided a pharmacist to review the patients through a remote consultation, which required an agreement with each practice. Pharmacists needed to work within the workflows and referral pathways of local practice systems; hence some independent actions that a pharmacist could take in one practice were not possible in others. Furthermore, although the pharmacists provided practices with considerations for patient care, such as referral to smoking cessation or pulmonary rehabilitation, influenza vaccinations, and referral to specialists, some practices were reluctant to action considerations due to workload.

Solution

Pharmacists signed agreements with individual practices, allowing them to work on behalf of the practice and access their clinical system. Pharmacists were provided with the CDS that summarized the considerations for best-practice assessment, treatment, and management of MHR patients, based on current national and international COPD guidelines, as well as expert opinion from steering committee members. The CDS was updated over time in response to clinician feedback. To minimize general practitioner burden in relation to the QIP, the pharmacist sought permission to action as many of the generated considerations as possible, within the local clinical pathways.

Each patient's care and treatment was agreed upon by the patient and their general practitioner according to individual needs and circumstances. For example, over 90% of newly diagnosed and 50% of already diagnosed patients had been prescribed either no inhaled maintenance therapy or single agent therapy only (LAMA or LABA or ICS) at the time of the remote clinic despite their MHR status; considerations to optimize their therapy were therefore suggested. In addition, more than a quarter of identified MHR COPD patients had a cardiovascular disease risk score (QRISK3) of ≥20% and required further assessment of potential cardiovascular disease.

Lessons learned

Developing a CDS package based on evidence-based guidance and expert opinion ensured that the remote pharmacist reviews and subsequent considerations reflected best practice and were standardized where possible. However, variations between localities, such as formularies, availability of practice-based respiratory nurses, and availability of specialists for referrals needed to be taken into account.

Appropriate follow-up

Practical barriers

The CONQUEST QIP aimed to review all patients within 3–4 months following the initial remote pharmacist clinic. This was an ambitious schedule with the resources that were available. In some cases, practices were resistant to additional workload, whilst others preferred to carry out aspects of the review themselves. During some follow-ups it was found that patients did not receive the treatment plans recommended by the pharmacist after the initial remote clinic.

Solution

Patients were prioritized for further review based on questionnaire responses regarding ongoing COPD burden and suitability for further intervention as per the CDS. This allowed allocation of administration and clinician time to patients that were potentially more likely to benefit from further intervention. If practices preferred to conduct reviews themselves, OPC provided support to guide them through this process and align with the CDS. Where EHR monitoring found that patients were not receiving the treatment plans proposed by the QIP, further patient reviews were arranged to discuss patients' symptoms before sending updated considerations to the practice.

Lessons learned

Follow-up is necessary to ensure the effectiveness of a QIP. Prioritizing patients based on disease burden and scope for benefit was a pragmatic way of following up patients with the greatest need within the limited resources available. Options for less intensive follow up could be explored in the future, to ensure that all patients received a review after their initial treatment, irrespective of clinical need. For patients deemed lower priority for clinical follow-up, monitoring of EHR data was useful to determine if the previously recommended treatment plans were actioned.

Overview

This manuscript provides a detailed description of the steps involved in implementing the CONQUEST QIP, acknowledging the practical barriers encountered, their solutions, and the lessons learned. These are clearly delineated and summarized in Table 2.

Conclusion

Implementation of the CONQUEST QIP was possible in the UK and successfully identified MHR COPD patients. More than a quarter of patients identified in this programme had high cardiovascular risk according to QRISK3. Identification and treatment of this high-risk group may represent a considerable opportunity for improvements in patient outcomes and health care utilization whilst focusing resources on relatively few patients per practice. The impact of the CONQUEST QIP on patients' respiratory and cardiac health outcomes will be evaluated as part of an ongoing cluster randomized trial (PREVAIL UK, registration number ISRCTN15819828), the results of which will be reported in due course.

A review of previous research on the common barriers in implementing QIPs identified ten key challenges (Dixon-Woods

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et al., 2012). Some of the practical barriers we encountered reflect these issues. The hurdles we encountered in recruiting practices reflect the recognized challenges of convincing people that there is a problem and that the solution chosen is the right one. Similarly, the difficulties we encountered with data acquisition and processing mirror the well documented challenges of getting data collection and monitoring systems right. In other QIPs tribalism and lack of staff engagement have been described but we did not encounter this problem. The scale of resource required to support QIPs is often underestimated, and adequate support and dedicated time are needed. The implementation and success of QIPs is difficult in situations where organizational capacity is inadequate, and culture is adverse (Dixon-Woods *et al.*, 2012). In some practices, we encountered reluctance to take on extra reviews and follow-up appointments, and the availability of spirometry was generally poor – extra resources were needed to overcome these barriers.

There has been much discussion of the importance of involving patients in the design of QIPs but relatively little consideration of how individual patients can be encouraged to participate in the programmes. It is well recognized that within groups of patients likely to benefit from QIPs there will be a spectrum of willingness to engage. Across different social and economic groups, people with low willingness to engage are less likely to seek help or to follow management advice and more likely to have worse outcomes (Kinney *et al.*, 2015; Shnaigat *et al.*, 2022), making the QIP particularly relevant for these people. The variability in the return of questionnaires in our patients reflected this spectrum.

Whilst the challenges we identified were in many ways similar to some of those encountered in implementing other programmes, the novelty of our work is the identification of practical generalizable solutions that an Integrated Care Board or equivalent health care provider would need to take to implement the CONQUEST QIP in similar settings. The exact number and types of patients identified are likely to vary between different implementations. A future challenge with a wider rollout of CONQUEST is the provision of resources to primary care practices to allow them to carry out CONQUEST activities as independently as possible. This includes appropriate resources, incentives, and training for quality-assured spirometry clinics and for carrying out patient reviews in line with the CONQUEST standards and CDS. Previous work has demonstrated that QIPs are more effective at changing practice when targets are aligned with financial incentives (Hurst *et al.*, 2020), and this is likely to be an effective investment in future QIPs. The identification of high-risk patients was streamlined in the current CONQUEST implementation using an algorithm based on EHR data. This algorithm did not solely rely on proactive healthcare seeking behaviours in patients to identify those at high risk and may allow the QIP to reach patients that do not actively engage with traditional healthcare. Similar EHR identification processes could be used by health care providers or outsourced to healthcare partners in future implementations of the QIP.

Potential challenges to implementing a large-scale QIP have been identified and addressed. Key implications for other large-scale QIPs include the value of designing a programme that can apply to a wide range of local contexts, investing in monitoring data across all steps of a programme to efficiently detect and troubleshoot issues, and how prioritization of patients based on potential impact allows allocating limited resources in a QIP.

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