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Strategies that promote sustainability in quality improvement activities for chronic disease management in healthcare settings

Citation for published version:
Evans, A, Soremekun, S, Stanley, B, Appiagyei, F, Couper, A, Taylor, O, Le, T, Pullen, R, Jones, S, Carter, V, Price, C, Jones, R, Hancock, K, Bosnic-Anticevich, S, Ryan, D & Price, D 2020, 'Strategies that promote sustainability in quality improvement activities for chronic disease management in healthcare settings: A Practical Perspective', *Quality in Primary Care*. <https://primarycare.imedpub.com/strategies-that-promote-sustainability-in-quality-improvement-activities-for-chronic-disease-management-in-healthcare-settings-a-p.php?aid=33837>

Link:
Link to publication record in Edinburgh Research Explorer

Document Version:
Peer reviewed version

Published In:
Quality in Primary Care

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OPEN ACCESS

Download date: 23. Jul. 2021

Title	Strategies that promote sustainability in quality improvement activities for chronic disease management in healthcare settings: A Practical Perspective
Short Title	Sustainable quality improvement for chronic disease management in healthcare settings
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Abstract

Healthcare providers recognise the value of quality improvement (QI) activities that enhance the care received by service users. QI is particularly effective for the management of long-term conditions requiring linked care. However, starting and sustaining QI programmes in practice can be time-consuming and difficult and may produce inconclusive and/or inconsistent results. As a not-for-profit social enterprise, Optimum Patient Care (OPC) has been delivering effective and sustainable QI since 2005 in healthcare systems in several countries.

This paper provides a roadmap for the implementation of collaborative QI programmes in a range of settings across three countries. It summarises the barriers we have experienced in the QI cycle and solutions we have identified in our history of working with healthcare providers to deliver QI programmes in primary and secondary care. Key lessons include the strategic involvement of partners in the fields of medicine, health IT, data science and epidemiology, to harness, understand and act on the insights gained from patient and practice electronic health data (EHR) alongside crucial input from patients and practicing clinicians themselves.

QI aims resource-poor healthcare providers to increase the precision of identifying key patient groups requiring further follow-up – such as those at risk of worsening health outcomes using risk prediction tools. Parallel goals are to increase the proportion of patients receiving prompt and appropriate treatment and to increase patient engagement. We achieve this by providing customised software tools and disease management algorithms to our healthcare partners to allow for automation of aspects of QI that have traditionally involved a manual process. Sharing our experience of these methods helps to embed a sustainable programme of QI in many systems in varied settings.

Keywords: Quality Improvement; Chronic Disease; Patient Care; Patient Reported Outcomes, Electronic Medical Records, Sustainable Development

Introduction

Managing chronic diseases in healthcare is challenging as patients require consistent, joined-up support and personalised treatment over the long term[1]. The practice of quality improvement (QI) - the use of formal or informal tools to assess and improve the quality of the care patients receive, is a key part of optimising patient management in this setting[2–4].

Whilst there is much enthusiasm for QI as a key route to improving patient outcomes, in practice it can be much more difficult to implement and make routine. Central to this is the variability in approaches to and needs of QI[4,5] and the perceived lack of time and competing resources required to do it well[3,6]. Despite a proliferation in the QI literature particularly on broader issues of success and sustainability[7–9], there remains a gap for practical, implementable solutions for time-poor clinicians.

Optimum Patient Care (OPC) is a non-profit social enterprise founded in 2005 (Figure 1), to work alongside healthcare providers to deliver sustainable chronic disease QI programmes. OPC delivers an evidence-based, guideline-driven, expert-led and general practice informed implementation strategy to deliver effective QI. Here we discuss the successes and lessons learnt in addressing some of the key barriers to sustainable QI.

The QI Cycle: Common Barriers to Sustainable QI and Solutions

We approach QI as a cycle of activities (Figure 2) which: first seeks to understand the context and needs of the healthcare setting (step 1), reflect on these needs in parallel with national or international standards for care (step 2), work with practitioners to set achievable and measurable targets (step 3), implement change (step 4), re-evaluate the care provided and embed QI in routine practice (step 5).

Step 1: Current Practice

Demonstrating the need for improvement using practice and patient data can be a persuasive tool to engage staff in QI[6]. Physicians often cite lack of buy-in or resources as reasons for poor engagement with QI[6,7], a shortage of the skills required to harness the wealth of clinical data they produce[8,9], and/or little understanding of how to involve patients in these processes[10]. To support practices in the assessment of the current state of care provision and potential areas for improvement, we have developed simple, automated tools to collect and assess data from electronic medical records (EMR) and patient questionnaires (patient reported outcomes/information – PRO/I).

As data privacy is a legitimate concern, we take a strict approach to de-identifying data – we do not collect any practice/patient identifiers; we use irreversible hashing algorithms to pseudonymise patient identifiers (IDs), and in the absence of inexpensive commercial options, we developed a robust custom redaction tool (https://optimumpatientcare.org/redaction/) to redact free text data to further enhance anonymity.

Step 2: Reflect on Current Standards

In an environment of continuously updated guidelines and "pay for performance" funding, clinicians struggle to keep abreast of recommendations and best-practice[11]. Standards that are linked to financial incentives can be limited in scope, focused on a select group of patients where exception-reporting (exclusion of patients from formal audit or QI)[12] may mean that key groups of excluded patients do not benefit from improved care practices.

Using the latest guidance informed by our steering committees of clinical experts[13,14], we summarise guidelines/standards in clear and accessible formats for practitioners, which are reviewed against data collected for the practice. Following feedback from the clinicians and experts, our programmes provide recommendations for both broad groups and individual patients, reflecting current, local or national guidance.

Step 3: Establish Targets

Like many others, we have found that setting targets for QI is a difficult, protracted process requiring colleagues to overcome a lack of consensus in choosing which problems to address[6], often compounded by previous negative experiences with overambitious targets[2]. Our evolutionary approach helps to set reasonable targets by using practice and patient information to describe current practice, comparing this to local, national or international standards coupled with documented histories of achievable targets successfully implemented by providers in similar situations. We provide digital templates for standardised data entry, practice and patient level reports which are simple and clear with visualisations; summarising current care and recommending measurable targets for improvement. While we develop our own feedback system, we use pre-existing work when appropriate. An example target is the identification of high-risk asthma patients which may be 'hidden' to clinicians: We have implemented a peer-reviewed automated risk-prediction algorithm[15] that scores each patient

on the likelihood of future asthma attacks (Figure 3) and have used the validated TargetCOPD algorithm to identify patients at risk of COPD[19].

Step 4: Implement Change

We have learnt that clinicians respond well to patient stories. Patients also feel listened to when they are invited to see their GP after completing an OPC questionnaire, or when provided with an individualised report. Evidence shows that routinisation of QI activities like these is key to sustainability[16] – thus our reports and templates are designed to be embedded in routine care and to support everyday clinical decision making. This process has grown out of experience and requires technical infrastructure and expertise, which is not always readily available to practices. A key lesson was to move from simply implementing systems that support data-driven QI, to also maintaining and developing them for the healthcare providers we support.

Step 5: Re-evaluate

An important motivator for continuing QI is the "I" - "Improvement" aspect – the ability to demonstrate improvement and the value of what has been achieved[10,11]. Assessing the impact or success of a QI programme is no small undertaking. Figure 2 step 5 highlights several reoccurring themes, summarised as a requirement for both resources and a willingness to re-engage with the cycle. Our evaluations are time-bound to maintain momentum and are based on periodic re-extraction of EMR and PRO/I data and auto-generation of reports to help healthcare providers track their improvements. A recent evaluation of our chronic obstructive pulmonary disease (COPD) QI programme in UK demonstrated that practices which implemented the programme saw an overall 20% reduction in the proportion of high risk

patients having a COPD exacerbation in the 12m following the start of the QI programme, compared to 10% reduction across all practices not actively doing QI.

Conclusion

It is increasingly recognised that healthcare practitioners, patients, the health service and the economy can benefit from improvements in patient care for chronic diseases. We have shown that large scale, collaborative QI programmes can have clear measurable benefits with little impact on workload[7,17]. Following a decade of refinement of our chronic disease QI model, we have learnt that working alongside primary care clinicians to integrate automated, non-resource-intensive programmes that involve both clinic staff and patients can be a highly effective means to promote a long term culture of QI.

Submission Declaration

This contribution is original. The work has not been published previously and is not currently under evaluation by another journal.

Ethical Approvals

Quality Improvement programs do not fall under ethical approvals.

Acknowledgements

We would like to thank all authors, contributors, and reviewers for the development of this article. Additional thanks to the publishers for their support in the publication process.

A large amount of respect and appreciation goes to the practices who undergo continuous quality improvement, through participation in this program. Their wish to contribute to the advancement of this subject of interest, helps to provide greater standards of care to their patients.

Source of Funding

The OPC QI program is fully funded by OPC Global Ltd.

Conflict of Interests

Alexander Evans, Seyi Soremekun, Brooklyn Stanley, Francis Appiagye, Amy Couper, Oliver Taylor, Rachel Pullen, Sophie Jones, Victoria Carter and **Chris Price** are employees of Optimum Patient Care and the Observational and Pragmatic Research Institute, which has conducted research in respiratory disease funded by the following organizations in the past 5 years: Anaxys, AstraZeneca, Boehringer Ingelheim, British Lung Foundation, Chiesi, Circassia (formerly Aerocrine), GlaxoSmithKline, Harvey Walsh, Mapi, Morningside Healthcare, Mundipharma, Mylan (formerly Meda), Napp, Novartis, Orion, Plymouth University, Regeneron, Respiratory Effectiveness Group, Roche, Sanofi, Takeda, Teva, University of East Anglia, Zentiva (a Sanofi company).

Rupert Jones reports grants, personal fees, and non-financial support from AstraZeneca and OPRI, personal fees and non-financial support from Boehringer Ingelheim, grants, personal fees, and non-financial support from GSK, grants and non-financial support from Novartis, non-financial support from Nutricia, and personal fees from Pfizer outside the submitted work.

Thao Le declares educational grants from AstraZeneca, Bayer, Boehringer Ingelheim, Care Pharmaceuticals, GlaxoSmithKline, Mylan, Novartis and Teva.

Kerry Hancock declares no conflict of interest.

Sinthia Bosnic-Anticevich has received honorarium for participation in expert advisory boards and given lectures for Teva Pharmaceuticals, AstraZeneca, GSK, Mundipharma, Sanofi, Mylan and received unrestricted research grants from Mylan, AstraZeneca, Teva and Mundipharma International.

Dermot Ryan has (in the last 3 years) lectured on behalf of, received sponsorship from, or acted as a paid advisor to Mylan, AZ, Chiesi, Novartis, GSK, Boehringer Ingelheim and Regeneron.

David Price has board membership with Amgen, AstraZeneca, Boehringer Ingelheim, Chiesi, Circassia, Mylan, Mundipharma, Novartis, Regeneron Pharmaceuticals, Sanofi Genzyme, Teva Pharmaceuticals, Thermofisher; consultancy agreements with Amgen, AstraZeneca, Boehringer Ingelheim, Chiesi, GlaxoSmithKline, Mylan, Mundipharma, Novartis, Pfizer, Teva Pharmaceuticals, Theravance; grants and unrestricted funding for investigator-initiated studies (conducted through Observational and Pragmatic Research Institute Pte Ltd) from AstraZeneca, Boehringer Ingelheim, Chiesi, Circassia, Mylan, Mundipharma, Novartis, Pfizer, Regeneron Pharmaceuticals, Respiratory Effectiveness Group, Sanofi Genzyme, Teva Pharmaceuticals, Theravance, UK National Health Service; payment for lectures/speaking engagements from AstraZeneca, Boehringer Ingelheim, Chiesi, Cipla, GlaxoSmithKline, Kyorin,

Mylan, Mundipharma, Novartis, Regeneron Pharmaceuticals, Sanofi Genzyme, Teva Pharmaceuticals; payment for the development of educational materials from Mundipharma, Novartis; payment for travel/accommodation/meeting expenses from AstraZeneca, Boehringer Ingelheim, Mundipharma, Mylan, Novartis, Thermofisher; funding for patient enrolment or completion of research from Novartis; stock/stock options from AKL Research and Development Ltd which produces phytopharmaceuticals; owns 74% of the social enterprise Optimum Patient Care Ltd (Australia and UK) and 74% of Observational and Pragmatic Research Institute Pte Ltd (Singapore); 5% shareholding in Timestamp which develops adherence monitoring technology; is peer reviewer for grant committees of the Efficacy and Mechanism Evaluation programme and Health Technology Assessment; and was an expert witness for GlaxoSmithKline.

How this fits in with quality in primary care

What do we know?

Primary care bears much of the growing burden of the management of chronic diseases, as patients require long term support care and treatment(1). This can be challenging given the rise in the number of years lived with disease, (18) and the ever-changing evidence landscape for patient treatment. Primary care quality improvement (QI) programmes, the practice of assessment and improvement of the care provided to patients, can be very valuable in this context (1). However, implementing QI programmes can be challenging due to lack of skills, resources or will to see them through (3-5, 7), particularly for chronic conditions which often have complex care requirements.

There have been numerous reviews of the barriers to effective QI programmes, with many providing general conceptual methods to overcome them(4,6,19). However, these often fall short of providing practical, implementable solutions for time-poor clinicians to whom QI may seem too big an activity to initiate and routinise. Optimum Patient Care is a social non-profit enterprise, with over a decade of experience in supporting healthcare practitioners to implement effective QI programmes. In this report, we share our lessons learnt, and successes achieved in carrying out sustainable QI for chronic disease management.

What does this paper add?

Our main messages are

I) The effective use of clinical data does not have to be an insurmountable hurdle to good QI in poorly resourced healthcare settings. By engaging with external services to implement, extract and analyse patient and practice data, clinics can focus on the critical activities that effect change.

II) Data privacy and security are major concerns for health services and patients, so a conservative approach to collecting and deanonymizing electronic medical data is recommended. The availability of commercial ID hashing (masking) and free-text redaction tools was low in our experience, and those tools that were available tended to be cost-prohibitive for a family GP practice. More opportunities for collaboration between academic and/or non-profit organisations with primary and community healthcare services can be a solution for the development of inexpensive, custom-built tools.

III) Standard audits, national QI programmes and staff incentive programmes may have strict criteria for patients which are included in the assessment of the quality of care provided; this can lead to high levels of exception reporting of groups of sick patients who may therefore be excluded from improvement activities. Because of this, we developed our QI programmes to collect data and report on the outcomes for both the broad patient population, as well as for specific groups fitting criteria for national audit/QI programmes.

IV) Keeping abreast of best practice in an environment of changing care standards can be difficult for a busy clinic. We devoted resources and time to both monitoring updates in best practice guidelines, but also to apply the latest academic evidence to practice – e.g. the implementation of risk prediction algorithms in clinical decision support tools.

Most practitioners understand the advantages of embedding QI activities in routine care (routinisation), however achieving this can be difficult; identifying the hurdles to sustainability of QI programmes are key to understanding the solutions. Our experience showed that implementing time bound QI targets and assessments, and automation of the production of reports and of other decision support systems can increase the chances of success in effecting sustainable change. The paper highlights key successes using our respiratory QI programme as an example: the reduction in the overall risk of COPD exacerbations in practices engaging in our COPD QI programme, and the translation of the Respiratory Effectiveness Group asthma exacerbation risk prediction model into an accessible tool to encourage patient engagement.

Figure 1. Optimum Patient Care: Locations and areas of focus for supporting quality improvement.

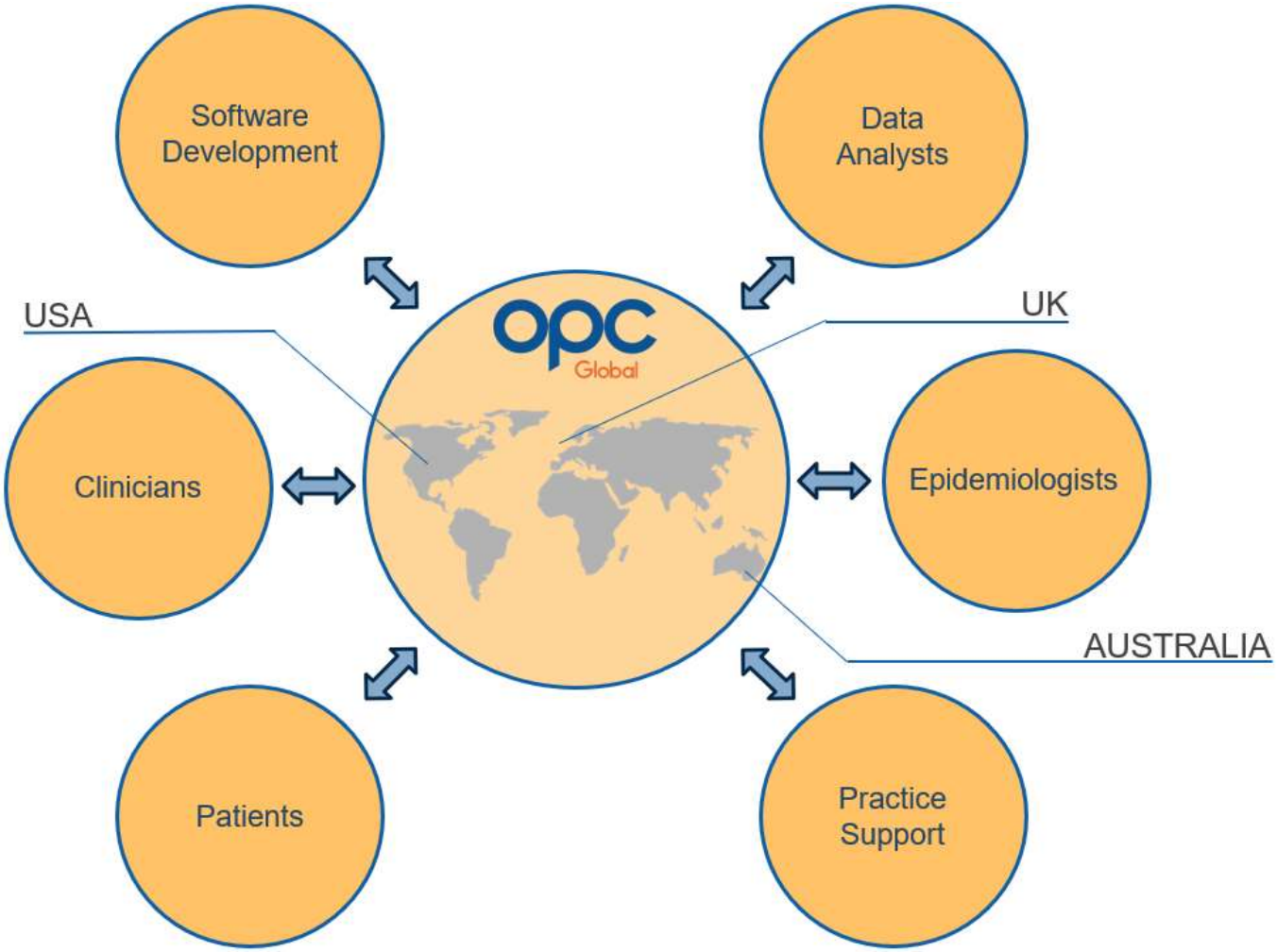


Figure 2. The Cycle of Quality Improvement in Primary Care: Barriers and OPC solutions

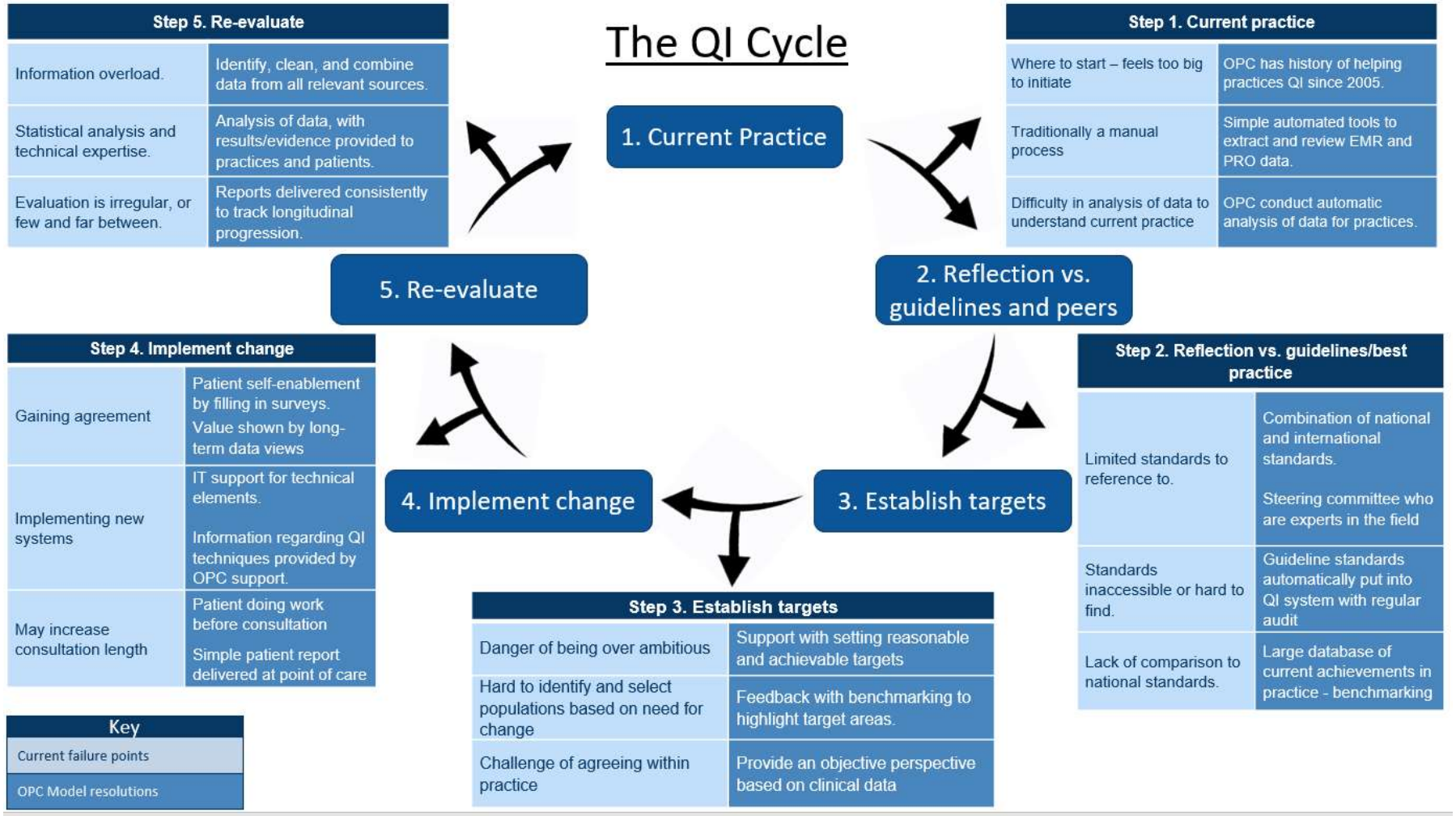
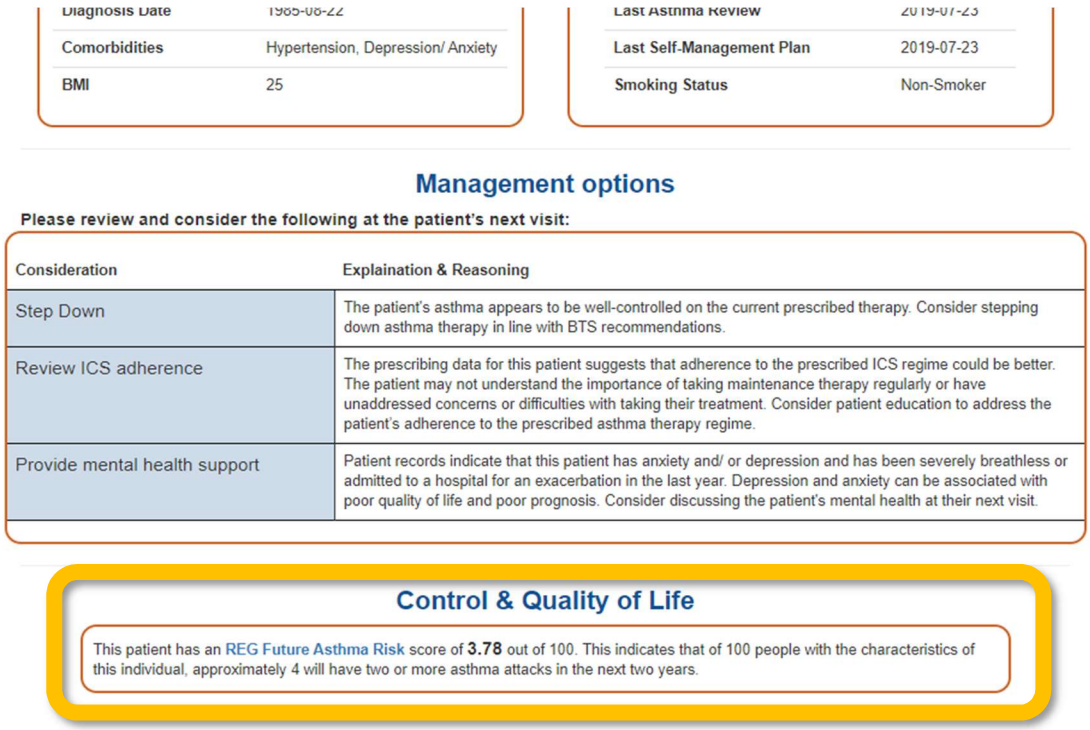


Figure 3. Application of the Respiratory Effectiveness Group (REG) algorithm to predict the risk of future exacerbations in patients with asthma in quality improvement programmes: Excerpt from an anonymised OPC UK asthma patient report showing individualised output of the asthma risk predictor (yellow box)



Diagnosis Date	1985-08-22
Comorbidities	Hypertension, Depression/ Anxiety
BMI	25

Last Asthma Review	2019-07-23
Last Self-Management Plan	2019-07-23
Smoking Status	Non-Smoker

Management options

Please review and consider the following at the patient's next visit:

Consideration	Explaination & Reasoning
Step Down	The patient's asthma appears to be well-controlled on the current prescribed therapy. Consider stepping down asthma therapy in line with BTS recommendations.
Review ICS adherence	The prescribing data for this patient suggests that adherence to the prescribed ICS regime could be better. The patient may not understand the importance of taking maintenance therapy regularly or have unaddressed concerns or difficulties with taking their treatment. Consider patient education to address the patient's adherence to the prescribed asthma therapy regime.
Provide mental health support	Patient records indicate that this patient has anxiety and/ or depression and has been severely breathless or admitted to a hospital for an exacerbation in the last year. Depression and anxiety can be associated with poor quality of life and poor prognosis. Consider discussing the patient's mental health at their next visit.

Control & Quality of Life

This patient has an REG Future Asthma Risk score of **3.78** out of 100. This indicates that of 100 people with the characteristics of this individual, approximately 4 will have two or more asthma attacks in the next two years.

References

1. Reynolds R, Dennis S, Hasan I, Slewa J, Chen W, Tian D, et al. A systematic review of chronic disease management interventions in primary care. BMC Fam Pract. 2018 Jan 9;19(1):11.

2. McCallum M, McNab D, Luty S, Bowie P, McWalter G, McKay J. Quality Improvement in Primary Care: What to do and how to do it. NHS Education for Scotland; 2018 p. 47.

3. Dawda P, Jenkins R, Varnam R. Quality improvement in general practice. :32.

4. NHS England. An Introduction to Quality Improvement in General Practice [Internet]. 2019 Apr [cited 2020 Feb 26] p. 9. (NHS Long Term Plan Series). Available from: https://www.england.nhs.uk/wp-content/uploads/2019/03/an-introduction-to-quality-improvement-in-general-practice.pdf

5. Ling T, Health Foundation (G.-B.). Involving primary care clinicians in quality improvement: an independent evaluation of the Health Foundation's engaging with quality in primary care programme : final report. London, G.-B.: Health Foundation; 2012.

6. Dixon-Woods M, McNicol S, Martin G. Ten challenges in improving quality in healthcare: Lessons from the Health Foundation's programme evaluations and relevant literature. BMJ Qual Saf. 2012;21(10):876–884.

7. Kaplan HC, Brady PW, Dritz MC, Hooper DK, Linam WM, Froehle CM, et al. The Influence of Context on Quality Improvement Success in Health Care: A Systematic Review of the Literature. Milbank Q. 2010 Dec;88(4):500–59.

8. Robert G, Sarre S, Maben J, Griffiths P, Chable R. Exploring the sustainability of quality improvement interventions in healthcare organisations: a multiple methods study of the 10-year impact of the 'Productive Ward: Releasing Time to Care' programme in English acute hospitals. BMJ Qual Saf. 2020 Jan 1;29(1):31–40.

9. McCalman J, Bailie R, Bainbridge R, McPhail-Bell K, Percival N, Askew D, et al. Continuous Quality Improvement and Comprehensive Primary Health Care: A Systems Framework to Improve Service Quality and Health Outcomes. Front Public Health [Internet]. 2018 [cited 2020 Jul 29];6. Available from: https://www.frontiersin.org/articles/10.3389/fpubh.2018.00076/full?utm_source=outbrain.com-internet&utm_medium=cpc&utm_campaign=vertical_criminal+justice&campaignid=70161000001Cq4dAAC&vid=2117383%3FStartPagearticles%2F%3FStartPagearticles%2F%3FStartPage

10. Parchman ML, Anderson ML, Coleman K, Michaels LA, Schuttner L, Conway C, et al. Assessing quality improvement capacity in primary care practices. BMC Fam Pract. 2019 Jul 25;20(1):103.

11. Greiver M. Do electronic medical records improve quality of care? Can Fam Physician. 2015 Oct;61(10):847–9.

12. Manca DP. Do electronic medical records improve quality of care? Can Fam Physician. 2015 Oct;61(10):846–7.

13. Jabbal J. Embedding a culture of quality improvement. :36.

14. Chin L, Satell G. How Physicians Can Keep Up with the Knowledge Explosion in Medicine. Harvard Business Review [Internet]. 2016 Dec 19 [cited 2020 Feb 26]; Available from: https://hbr.org/2016/12/how-physicians-can-keep-up-with-the-knowledge-explosion-in-medicine

15. NHS Digital. Quality and Outcomes Framework, Achievement, prevalence and exceptions data 2018-19 [PAS] [Internet]. NHS Digital. 2019 [cited 2020 Feb 17]. Available from: https://digital.nhs.uk/data-and-information/publications/statistical/quality-and-outcomes-framework-achievement-prevalence-and-exceptions-data/2018-19-pas/frequently-asked-questions

16. Steering Committee – OPC [Internet]. 2020 [cited 2020 Apr 7]. Available from: https://optimumpatientcare.org/clinical-experts/

17. Steering Committee – OPCAU [Internet]. 2020 [cited 2020 Apr 7]. Available from: https://optimumpatientcare.org.au/who-we-are/our-team/

18. Blakey JD, Price DB, Pizzichini E, Popov TA, Dimitrov BD, Postma DS, et al. Identifying Risk of Future Asthma Attacks Using UK Medical Record Data: A Respiratory Effectiveness Group Initiative. J Allergy Clin Immunol Pract. 2017 Aug;5(4):1015-1024.e8.

19. Haroon S, Adab P, Riley RD, Fitzmaurice D, Jordan RE. Predicting risk of undiagnosed COPD: development and validation of the TargetCOPD score. Eur Respir J [Internet]. 2017 Jun 1 [cited 2020 Jul 29];49(6). Available from: https://erj.ersjournals.com/content/49/6/1602191

20. Greenhalgh T. Role of routines in collaborative work in healthcare organisations. BMJ. 2008 Nov 17;337(nov17 1):a2448–a2448.

21. Balasubramanian BA, Marino M, Cohen DJ, Ward RL, Preston A, Springer RJ, et al. Use of Quality Improvement Strategies Among Small to Medium-Size US Primary Care Practices. Ann Fam Med. 2018 Apr 1;16(Suppl 1):S35–43.