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Improving access to the Endocrine Clinic in a teaching hospital for patients with thyroid dysfunction

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Improving access to the Endocrine Clinic in a teaching hospital for patients with thyroid dysfunction

A dissertation submitted in part fulfillment of the degree of MSc
in Physician Associate Studies, School of Medicine, Physician
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Declaration Form

I declare that this dissertation, which I submit to RCSI for examination in consideration of the award of a higher degree MSc Physician Associate Studies, is my own personal effort. Where any of the content presented is the result of input or data from a related collaborative research programme this is duly acknowledged in the text such that it is possible to ascertain how much of the work is my own. I have not already obtained a degree in RCSI or elsewhere on the basis of this work. Furthermore, I took reasonable care to ensure that the work is original, and, to the best of my knowledge, does not breach copyright law, and has not been taken from other sources except where such work has been cited and acknowledged within the text.

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Abstract

Thyroid disease is very common with thyroid dysfunction affecting approximately 4% of the population. In many cases, specialist opinion is required to effectively manage patients with thyroid dysfunction who may often wait long periods of time to access specialist care, due to the prevalence of conditions and competing clinical requirements, especially from people with diabetes. Most endocrine services cannot see patients with thyroid dysfunction as often as indicated by international guidelines. In the thyroid clinic studied in February 2017, it was found that the waiting time for new referrals was 12 weeks, while return patients waited 14 weeks on average to be seen at the thyroid clinic. This means that patients with hypothyroidism- and hyper-thyroidism cannot be seen following treatment commencement in 2-6 (hypothyroid) or 3-4 (hyperthyroid) weeks as recommended. This project addresses the factors contributing to this delay. Using a Define, Measure, Analyse, Improve and Control (DMAIC) approach, a Plan Do Study Act (PDSA) cycle is proposed to improve an access to the endocrine clinic for patients with thyroid dysfunction. Identifying that the frequency of thyroid clinics does not allow the service to meet guidelines, it is proposed to introduce a “virtual” thyroid clinic which will be consultant-delivered. Patients’ laboratory data, treatment regimen and clinic notes will be reviewed at a once monthly clinic where the patients will not be in attendance and treatment decisions will be communicated to patients. The aim of this quality improvement intervention is to shorten the wait time for return patients by two months over the first year.

Chapter 1: Introduction

1.1 Introduction

The majority of patients attending endocrine clinics have Diabetes Mellitus (DM) or disorders of the thyroid gland. Other conditions such as pituitary and adrenal diseases are significantly less common. Most endocrine services will have separate clinics for diabetes and endocrine disorders, so patients with thyroid disease make up the majority of attendees at the endocrine clinic.

Disorders of thyroid gland are either structural (nodules or cancer within the thyroid) or functional (over- or under-activity of the thyroid gland). Increasing the availability of ultrasounds and more sensitive ultrasound scanners means that the number of referrals of patients with nodules has increased significantly over recent years. In addition, thyroid function testing is frequently performed by primary care physicians as part of a routine “work-up” or because patients complain of non-specific symptoms such as fatigue. It is estimated that 1% of the population has hyperfunction of the thyroid gland and 3% have hypofunction (Giorda et al, 2017; Ross et al 2016). It is recommended that patients with hyperthyroidism are referred for specialist opinion and while many patients with hypothyroidism can be managed in primary care, there are some more complicated patients who do require specialist opinion and from speaking with the endocrine consultants it is clear that some General Practitioners (GP’s) are not comfortable managing hypothyroidism (Royal College of Physicians, 2017 and personal communication). This results in an excessive burden on the hospital services and delays for patients in assessing specialist opinion.

When patients with thyroid dysfunction are seen for specialist opinion, it is usual that they are either commenced on medications for hypothyroidism (L-thyroxine-LT4) or hyperthyroidism (anti-thyroid drugs-ATD's) or have the dosage of such medications changed. Thereafter, repeat testing is indicated in 3-4 weeks for patients with hypothyroidism or 2-6 weeks for patients with hyperthyroidism (American Thyroid Association, 2017). Specialist opinion is usually required to guide adjustment of dosages and decisions are made on the basis of repeat thyroid function tests (TFT's). Therefore, according to the American Thyroid Association, patients should be seen by the endocrinologist within a maximum of 6 weeks after introduction of treatment or dosage adjustments. In the case of new referrals, some GP's are comfortable to commence treatment for hypo or hyperthyroidism pending referral but in such cases, access to specialist should also be available within 6 weeks for further management.

Based on the prevalence data above and the catchment population of the hospital, which is over 300,000, a conservative estimate of the number of people with thyroid dysfunction in the area is approximately 10,000 (Giorda et al, 2017; Ross et al 2016). However, this does not take into account the number of people with nodular thyroid disease with normal function, who will also require referral for endocrine opinion. Clearly, providing specialist opinion to such a large cohort is a challenge. Currently, the waiting time for patients newly referred to the endocrine clinic at the hospital is not meeting the recommended targets above. The waiting time for return appointments for patients who have attended for their first appointment is likewise longer than recommended. Therefore, it is clear that it is not currently possible for

the endocrine service to provide a service to its patients that meets international guidelines for the management of thyroid dysfunction.

In this project, factors contributing to the current delay in the endocrine clinic seeing patients with thyroid dysfunction were investigated with the aim to develop a Quality Improvement (QI) plan with some quality improvement suggestions that should improve the service for patients with thyroid dysfunction attending the endocrine clinic at the hospital.

1.2 Organisational Context

The endocrine service at the Hospital provides care for a large cohort of patients from the Dublin 15 area as well as surrounding areas extending from the Navan Road to parts of counties Meath, Westmeath and Kildare. As the only endocrine team providing care for a catchment population in excess of 300,000, the demands on the service are very burdensome. The current team is comprised of two whole-time equivalent consultants with their junior doctors. For patients with diabetes mellitus (DM), there is a multidisciplinary team (MDT) that includes diabetes specialist nurses, one podiatrist, one dietician and administrative staff. There is no MDT for patients with endocrine conditions other than diabetes. As diabetes is one of the most common chronic disorders in the country, with a prevalence of about 6%, most of the resources provided to the endocrine team and most of the time is spent managing patients with DM, meaning that patients with endocrine conditions do not get the same level of service (Diabetes Ireland, 2017). Currently, there is one weekly clinic for patients with endocrine conditions. Up to 50 patients may be booked into each clinic including up to 10 patients presenting for their initial referral. This

cohort of patients will predominantly comprise of patients with thyroid disease but also includes patients with pituitary and adrenal disorders, disorders of calcium balance, women with polycystic ovarian disease and a variety of other less common conditions that require specialist expertise for management. The service receives approximately 600 new referrals per year of which 50% are patients with DM and the remainder are patients with other endocrine conditions. The referrals come predominantly from General Practitioners (GPs) in the catchment area but also from other services in the hospital including the Emergency Department and a small number of referrals from other hospitals. The endocrine team also provides an in-patient consultation service for patients with DM and endocrine conditions and many of these patients require clinic follow up. The development of on-site endocrine laboratory testing has also led to an increased number of referrals from other in-patient services.

Because of the nature of endocrine conditions, when a patient is referred, they frequently require further investigation. Such investigations may be complex and often involve dynamic testing of endocrine gland function. Therefore, the vast majority of patients require more than one appointment to appropriately diagnose and effectively manage their condition. This leads to a build-up of patients awaiting new appointments and a separate list awaiting return appointments. Given the many demands on the endocrine service, it is challenging for the team to provide optimal care for all patients. With 600 new referrals each year, of which 50% are endocrine patients, the waiting time for appointments may compromise optimal patient care. The introduction of national targets for waiting times for out-patient referral where 85% of patients should wait less than 52 weeks increases the pressure on the

service to provide timely care for patients. As of February 2017, the waiting time for a new patient referred to the endocrine clinic was 12 weeks while the wait time for patients returning for review after an initial appointment was 14 weeks. When a patient is referred to the service, usually a referral letter is received and triaged by one of the consultants. Depending on the perceived acuity of the patient's condition, they may be scheduled for an urgent appointment (generally within 4-6 weeks) a "soon" appointment (within 2 and 4 months) or a routine appointment (generally from 4-8 months). Notwithstanding this and the relatively short wait time for new referrals (12 weeks for the next available appointment as of February), there is usually a small number of patients breaching the recommended 52 weeks waiting time. Taking these organisational factors into account, it is challenging for the endocrine service to provide a timely and efficient service for patients with thyroid dysfunction.

1.3 Rationale for quality improvement

Patients with thyroid dysfunction usually require medical treatment, either for an overactive or underactive gland. Hypothyroidism is usually due to autoimmune disease affecting the gland. Other causes of hypothyroidism include: congenital hypothyroidism which is due either to failure of the gland to develop or to an inborn error of thyroid hormone production; iatrogenic hypothyroidism due to surgery or radioactive iodine treatment for previous hyperthyroidism or to medications including anti-thyroid drugs and amiodarone; thyroiditis during the recovery phase of the inflammation. The treatment of hypothyroidism is with replacement thyroid hormone (thyroxine), usually T4, and treatment is guided by measuring the pituitary hormone, thyroid stimulating hormone (TSH), which should be in the normal range if patients are adequately treated. Although hypothyroidism is generally perceived as being a

non-complicated condition, which can be easily treated in the community, there are several subtleties in its management which may require specialist advice. These include: whether or not subclinical hypothyroidism, which means a normal thyroid hormone level with an elevated TSH, is present and merits treatment; determination of what the ideal TSH level in treated patients should be; the need to ensure appropriate replacement during pregnancy when requirements may increase; whether or not T3 in addition to or instead of T4 should be used to optimally replace thyroid hormone; factors that can interfere with absorption of replacement hormone and therefore compromise adequate treatment of patients. In addition, following commencement of treatment or dose changes, patients require re-resting of their thyroid function in 3-4 weeks as recommended by the American Thyroid Association (ATA). Therefore, patients with hypothyroidism should generally be seen by a specialist to ensure appropriate diagnosis and treatment. Once stabilised, they can be effectively managed in the primary care setting.

Hyperthyroidism is more complex in terms of aetiology and treatment. While many patients can be treated effectively with anti-thyroid medication (ATM) such as carbimazole and propylthiouracil, others may require surgery, radioactive iodine or other treatments depending on the underlying cause. Many patients with hyperthyroidism will also have an autoimmune condition for which the first line of treatment is ATMs. However, nodular thyroid disease such as a single toxic nodule or a toxic multinodular goitre, is more commonly found in the middle-aged and elderly population. These patients require definitive treatment such as radioactive iodine or surgery since they will relapse after cessation of ATMs if the underlying nodular disease is not treated. Other causes of hyperthyroidism include thyroiditis,

either painful subacute or post-partum silent thyroiditis, where treatment with ATMs may result in a prolonged hypothyroid phase during recovery so these patients should not be treated with ATMs. Iatrogenic hyperthyroidism, either due to overly aggressive replacement of hypothyroid patients or in patients treated with amiodarone can also occur. In the case of amiodarone, two potential aetiologies can arise which require different treatment. Given this complexity of hyperthyroidism, it is essential that all patients with the condition are seen by specialists to ensure appropriate diagnosis and treatment. In terms of follow up, as recommended by the ATA, when patients are commenced on treatment they should be reviewed with repeat testing within 2-6 weeks.

As outlined above, thyroid dysfunction is common in the general population. Epidemiologic studies demonstrate that 1% have hyperthyroidism while 3% have hypothyroidism (Ross, 2016, Wiersinga 2014). If subclinical hypothyroidism is included, these numbers increase further. Between 3 and 15% of the population have subclinical hypothyroidism and many of these patients may not benefit from treatment (Peeters RP, 2017). Therefore, with this high prevalence of thyroid dysfunction, it is difficult to provide appropriate specialist care to patients to provide accurate diagnosis and appropriate safe management. As indicated, the endocrine clinic at the hospital is not appropriately resourced to provide care that meets international recommended standards and therefore there is a need to try to improve the quality of the care.

The Institute of Medicine defines quality of care in terms of six dimensions: safe; effective; efficient; timely; equitable and patient-centred. From discussions with one

of the Consultant Endocrinologists, it is clear that care for thyroid patients at the hospital does not meet a quality level in all 6 domains.

1.4 Aim and Objectives

1.4.1 Aim

The aim of this project is to improve access by reducing waiting times in the endocrine clinic at the hospital for patients with thyroid dysfunction returning for follow up visits.

1.4.2 Objectives

The objectives of the project were to:

1. Identify the factors that led to the delays in access to an endocrine clinic appointment for patients with thyroid dysfunction over the previous 18 months - using a fish bone diagram.
2. Design an intervention that can help improve/shorten the wait time for return thyroid patients attending the Hospital by two weeks over the first year.
3. Propose a QI intervention that can be piloted in the hospital by quarter 1, 2018.

1.5 Role of the student in the organisation and project

As a Physician Associate (PA) student, I have been attached to the endocrine team and have completed a clinical rotation at this hospital to gain clinical experience. The

idea for this project came from seeing patients in clinic whose thyroid dysfunction was not always successfully managed. Following a discussion with the endocrine consultant, it was clear that patients with thyroid dysfunction were not always seen in a timely manner. Therefore, I consulted with the department which co-ordinates referrals to the team to determine waiting time for both new and return patients attending the clinic. By performing a literature review, searching for guidelines on managing thyroid dysfunction, the recommendations for managing both hyper and hypothyroidism, specifically regarding the recommended frequency of attendance for patients with hypo- and hyperthyroidism were identified. It was clearly from this process that there was a need for improvement in terms of the waiting times for patients attending the clinic. From discussions with the consultant, I learned that the reasons for this are multiple and complex but that not being able to see the specialist team frequently enough was a contributory factor. By examining the data for the hospital clinic, I was able to document the extent to which the service is meeting these guidelines and consider the potential reasons for not meeting them. Following that, I attempted to identify the most important contributors to the waiting times and came up with a proposed intervention that I feel can lead to an improvement in the quality of care for the patients.

1.6 Summary

This chapter outlined that a delay in appointments exists in the service for patients with thyroid dysfunction attending the hospital. Access to specialist opinion for patients with thyroid dysfunction attending this secondary care service is not meeting internationally recommended standards. The shortcomings of the service were

discussed in the context of the demands on the service and the rationale for quality improvement was identified and discussed with an aim of reducing the wait time for patients by two weeks over the first year after a QI intervention. This project explored the factors contributing to the waiting times and recommends some intervention(s) designed to close this gap. The following chapters outline the literature review that was performed to inform the project (Chapter 2), the methods used (Chapter 3), how the QI intervention will be evaluated (Chapter 4) and Chapter 5 comprises the discussion of the project.

Chapter 2: Literature Review

2.1 Introduction

This chapter comprises the literature review that was carried out to inform the project. The search strategy is outlined and the main themes arising out of the literature review are presented and discussed.

2.2 Search Strategy

A literature search was performed using PubMed to determine previously published work on improvement of quality of care for patients with thyroid disease using the search phrase “quality improvement of care for thyroid patients.” This returned 65 citations which were reviewed. Many of these references were irrelevant as they did not pertain directly to thyroid disease. Most of the quality improvement initiatives in thyroid disease related to patients with thyroid cancer. Using the search phrase “quality improvement of care for patients with thyroid dysfunction” returned 9 citations none of which were directly relevant. A search using the phrase “thyroid dysfunction guidelines” yielded 295 citations. When this was narrowed down using “thyroid dysfunction guidelines ATA (American Thyroid Association)” it yielded 7 citations including the 2012 guidelines of the ATA for management of hypothyroidism (Garber et al, 2012). Using the search phrase “hyperthyroidism guidelines ATA” also returned 7 citations including the 2016 ATA guidelines for the management of hyperthyroidism and other useful references. By performing a google search for “on-line Endocrine text” the free on-line resource Endotext (www.endotext.org) was identified and this contained much useful background information regarding thyroid dysfunction. Reviewing some of the citations also yielded references to more generic principles of quality improvement.

2.3 Review of literature

In considering the importance of quality of care for patients with thyroid disease and how this may be improved, it is first necessary to consider the rationale for and principles behind quality improvement in health care in general.

2.3.1 Quality in Healthcare

The main goal of quality is to make and achieve real and sustained improvements that will lead to better patient outcomes, better experience of care and continued development in supporting the staff in delivering patient-centred care. This was emphasised in the recent Oireachtas Committee on the Future of Healthcare Slaintecare Report (Houses of the Oireachtas, 2017, page 5) in which the Chair, Deputy Roisin Shorthall highlighted aspects of a quality health care system in her summary stating that:

“Our task has been to consider how best to ensure that, in future, everyone has access to an affordable, universal, single-tier healthcare system, in which patients are treated promptly on the basis of need, rather than ability to pay.”

This quote touches on several aspects of a quality healthcare system including patient centeredness, timeliness and equitability.

One of the most commonly used definitions of quality in the context of health care is that of the Institute of Medicine for Healthcare Improvement, USA (Institute of Medicine, 2005). This Institute defined quality by using six different domains: patient-centred; efficient; effective; equitable; safe and timely. Although originally proposed some years ago (Institute of Medicine, 2005), the definition and domains of quality

were proposed to guide health care in the 21st century, remain relevant and can be applied to delivery of care in all settings from primary to highly specialised care.

The domains of quality in health care (Institute of Medicine for Healthcare Improvement) were considered. Patient-centred means care that is responsive and respectful to the needs, values and preferences of the individual seeking health care. This recognizes the rights of patients to be presented with appropriate information to enable them to make the choices regarding their health care that best meets their needs. Healthcare that is safe avoids any unnecessary physical or psychological harm by interventions designed to help patients and learns from adverse events using them as an opportunity to improve. Effective healthcare refers to the care that is evidence-based using the most up to date and best scientific rationale underpinning treatment interventions. This also includes refraining from delivering treatments that are not likely to benefit the individual patient. Precision medicine is the ultimate paradigm of effective health care, embracing the concepts of doing the right thing for the right patient at the right time, with the aim of enhancing the quality of patient health outcomes. Efficient care involves deriving the maximum benefit from our scarce health care resources, avoiding waste, especially of equipment and supplies. Timeliness of health care implies that the right care must be delivered at the right time to maximize patients' health outcomes. Unnecessary delays in investigations or treatment can result in adverse outcomes. Equitable health care involves providing equal care to everybody regardless of gender, ethnicity, socio-economic status, religion, disability, educational background or any other individual factors. These six dimensions of quality can be used to guide health care providers in designing and delivering systems of health care for any condition.

The World Health Organisation (WHO) defines quality in health care in very similar terms including: efficient; effective; accessible; equitable; safe and acceptable/patient centred (WHO, 2006). In this case, accessible is substituted for timely and incorporates the additional element of ensuring that patients have access to quality care within a reasonable proximity of where they live.

By searching on the Health Services Executive website, the Framework for Improving Quality in our Health Service (HSE, 2016) was found. It defines quality of care using fewer terms incorporating 4 domains: patient-centred; effective; safe; better health and well-being. Therefore, it can be seen that regardless of which definition is used, the basic thrust of defining quality in health care remains similar with an emphasis on care that is patient-centred and benefit patient's well-being.

Following this review, and the lack of a clearly articulated definition for quality of health care for patients with thyroid dysfunction, the Institute of Medicine definition was used as a framework to define quality care for this patient group.

Patients should not be harmed by the care that is provided with the intention of helping them. This concept has existed for thousands of years, certainly dating back as far as the Hippocratic Oath in which Hippocrates, born in 460 BC, talks of helping people but at least not harming them. This may be the origin of the phrase "primum non nocere" literally meaning first to do no harm. However, Irish data show a prevalence of 12.2% of adverse events in hospital admitted patients (Rafter, 2016). Worryingly, 70% were deemed to be preventable, 9.9% caused permanent disability

and 6.7% contributed to death. The need for a culture of safety to be developed in the Irish health care setting has been identified (Rafter, 2015).

Most cases of medical adverse events cannot be attributed to one single identifiable cause. The “swiss cheese” model is often used to describe such adverse events.

This model highlights the fact that when a series of system and people errors occur in alignment, despite the presence of these series of defences an adverse outcome can result (Reason, 2000). The approach to limiting such errors involves recognizing that humans are fallible and that it is human nature to make mistakes. Therefore, by building a series of checks and balances into the systems within which the individuals work, the chances of an adverse event occurring can be substantially reduced.

Medical errors could arise due to failure to provide care that meets any one or more of the domains of quality of health care. The waiting times in outpatient clinics present a significant issue in many health care systems because it prevents an efficient patient flow (Dinesh et al, 2013) and has a great potential to increase adverse health outcomes by delaying not only diagnosis of serious conditions but also treatment from which patients would benefit (Olsson et al, 2008). An example from the Irish context is the case of Susie Long who waited 7 months to undergo colonoscopy to be screened for bowel cancer. This was an example of lack of timeliness and lack of equitability and therefore of safety of health care.

2.3.2 Improving quality of health care for thyroid patients

A proposal to improve quality of health care will depend on identifying an area where care can be improved. Strategies can then be identified and developed to attempt to improve the quality of care. When an adverse event occurs in a healthcare setting, an investigation will usually be performed to identify the contributing factors. However, a more proactive approach to identify areas where quality can be improved and to develop strategies to improve it can prevent such adverse outcomes.

Thyroid disease is common as highlighted above and in most cases it is not associated with significant mortality. Many patients experience marked symptoms associated with thyroid dysfunction and quality of life can be adversely affected (Cramon et al, 2016). Prolonged periods of symptomatic thyroid dysfunction can be prevented by prompt attention to changes in associated clinical and biochemical markers, but this requires frequent blood testing and adjustment of doses of medication for hypothyroidism and hyperthyroidism. Subtle adjustments in dosage are often required particularly in hypothyroid patients and the level of expertise of health care professionals in the primary care setting may not be sufficient to optimise patient outcomes. Many patients on thyroid hormone replacement struggle to maintain normal thyroid function for a variety of complex reasons and also those with ostensibly normal thyroid function may continue to be symptomatic. Notwithstanding these challenges, there is little published literature on quality of care for patients with thyroid dysfunction. This may reflect the perception that thyroid dysfunction is not associated with significant mortality or morbidity, though many patients continue to complain of symptoms despite treatment indicating that current management approaches may not be providing quality care.

2.3.3 Virtual clinics

The concept of virtual clinics has emerged over recent years in health care. Essentially, this means that a clinic can be run where patients' cases can be reviewed without the need for a face to face consultation. This model has been used in many specialties, but the literature review did not reveal a substantial evidence base for use of virtual clinics for patients with thyroid diseases. One of the specialties that has successfully embraced virtual clinics is Orthopaedics. A recent review of the cost-effectiveness of virtual fracture clinics demonstrated that they are both clinically and cost-effective (McKirdy, 2017). There are now 32 virtual fracture clinics in the UK (McKirdy, 2017). Several other specialties have also incorporated virtual clinics. A successful template for telemedicine was developed a number of years ago in New Mexico for the improvement of health care for patients with hepatitis C in a remote region (Arora, 2007). This provides access for GPs to specialist opinion via video-conferencing, which allows patient cases to be discussed with the experts on the multi-disciplinary team. It also provides an opportunity for education of the primary care providers and reduces the need for patients to travel long distances. This highlights some of the advantages of virtual clinics. Although the patients with thyroid dysfunction would not be travelling such long distances, the ability to deliver clinics that do not require patients to take time out of their busy schedules is worth considering. Other services that have embraced the virtual clinic model include endoscopy (Ryan, 2014), renal medicine (Mark et al, 2011), rheumatology (Goldfien, 2016), diabetes (Basudev, 2016) and oncology (Costello et al, 2017). A virtual clinic for patients with Graves' disease has been developed at the Royal Berkshire NHS Trust, although no publication was found when searching this on PubMed.

Potential benefits of a virtual clinic include not only clinical- and cost-effectiveness, but also that once they have been designed to the satisfaction of the lead consultant and in-line with current evidence bases, they could be delivered by other appropriately trained health care professionals such as a nurse or physician associate. They have the potential to improve all domains of quality in health care. Therefore, virtual clinics have a number of potential benefits for patients and their utility in thyroid disease warrants more investigation.

2.4 Summary

In this chapter the methodology and content of the literature review underscoring this project has been presented. While there is extensive literature regarding quality in health care, how to define it, why it is important etc, there is very little literature regarding quality of health care for patients with thyroid dysfunction. The benefits of virtual clinics in a variety of medical and surgical specialties has been demonstrated and such approaches have the potential to improve care for patients with thyroid dysfunction.

Chapter 3: Methodology

3.1 Introduction

There are various approaches that can be taken to improve quality of health care. The essentials of quality improvement lie in identifying the actual areas where improvement is required. Another important component of quality improvement is having some measures that can be made to determine whether interventions aimed at improving quality are having an effect and what other knock-on effects they may have. This chapter will review approaches to quality improvement in health care and describe some of the models used. It will also apply these to the area for improvement identified to develop an understanding of the factors contributing to the delays in seeing patients with thyroid dysfunction in the clinics and to begin to develop a quality improvement plan to address this.

3.2 Approaches to Quality Improvement

One approach to quality improvement is the Plan-Do-Study-Act (PDSA) cycles where small-scale changes are defined, introduced evaluated and then either modified if unsuccessful or applied more widely if successful. Other approaches such as DMAIC also exist. This stands for Define, Measure, Analyse, Improve and Control. This approach allows a clear articulation of the problem (D), establishing the baseline performance measurements (M), identifying the root cause of the problem (A), coming up with and testing a potential solution to the problem (I) and monitoring any gains that are obtained with a view to maintaining them (C). While various approaches may be used, the essentials are the same...identifying the problem, figuring out why it exists, trying to improve it and assessing and/or modifying the interventions designed to improve it.

3.3 Rationale for Model Selected

In this project plan, I have used a DMAIC combined with PDSA cycle approach in attempting to improve the quality of care. The rationale for using these models is that DMAIC provides a framework to guide the process and the PDSA cycle uses small changes that can be evaluated and modified if necessary. This ensures that a lot of time and effort is not invested on a large project that may not produce the anticipated benefit.

3.4 Model Overview (PDSA)

PDSA cycles are well established methods of introducing quality improvement (Institute for Health Care Improvement, 2017). This involves a planning stage where an area for improvement is identified and the reasons for it considered, some possible improvements identified and a clear aim is described. The “Do” stage involves testing the change by trying out the plan and collecting some data to enable measurements of the effectiveness of the intervention and other knock-on effects can be quantified. In the “Study” phase, the results of the intervention will be reflected on and any lessons that are learned as to whether it worked, why it did or did not work and any problems that resulted from the intervention are considered. In the “Act” phase, a conclusion can be reached as to whether or not: the intervention was successful and can be left as it is for future application or scaling up; it needs to be adapted based on the learnings from the initial cycle; it should be abandoned as it was unsuccessful, impractical or had too many negative consequences such that an alternate plan needs to be designed.

3.5 DMAIC

Plan			Do	Study/Act
Define	Measure	Analyse	Improve	Control
Stakeholder analysis	Histogram	Fishbone Diagram	Proposed intervention	Evaluate impact of intervention
Process flow	Flow chart			Extend intervention to include new patients

Table 1. Outline of the DMAIC tools used in this project indicating also the relationship with the stages of the PDSA cycle.

3.5.1 Define

DMAIC, as outlined above, is an approach taken to quality improvement in business that has been also widely used in health care quality improvement (Kuwaiti, 2017; Yousef, 2017). Various tools can be used to define an area for improvement. Process maps are one such tool that can be very helpful. This involves drawing a map of all the steps or activities that are necessary to produce an outcome. They may provide greater clarity of thinking when considering factors that might mitigate against provision of a quality health care system.

Combinations of tools can be utilised in QI projects as there is usually more than one way to define and understand a problem. In this project, I have started by developing a process map outlining the current pathway from the GP referral to patients been seen for first appointments (Figure 1) and a second process map

outlining pathway for follow-up appointments once the patient has had their first visit (Figure 2).

3.5.1.1 Stakeholder analysis

Stakeholder	Involvement in project	Interest in project	Influence over project	Resources	Position	Impact of project on stakeholder
Student	High	High	High	Medium	Promoter	Low
Medical team	High	High	High	High	Promoter	High
Patients	Medium	Medium	Low	Medium	Defenders	High
Management	Low	Medium	Low	Medium	Defenders	Medium
Health service	Low	Medium	Low	Medium	Defenders	Medium

Table 2. Key stakeholders in the project with evaluation of their role/interest/influence over the project.

In undertaking this project, the various stakeholders involved were considered in terms of their input, interest and influence over the project, the resources that they can contribute to the project, whether they are likely to be a promoter, defender or whether they would block the project and finally the potential impact of the project on the stakeholder.

In addition to me as a student performing the project, the stakeholders in this project include the patients who will be expected to benefit from the proposed intervention by having their thyroid dysfunction managed more efficiently, more effectively and in a more timely manner. Although as outlined above, the proposed intervention will

target return patients with thyroid dysfunction only, at least in the first instance, by improving that service, there are potential indirect benefits for all patients attending the Endocrine service. Patients attending the virtual clinic will be able to avoid long waiting times, not only for appointments but also at appointments where some patients may wait over an hour to see the medical team for a consultation which may only take 10 minutes. Patients will also be able to attend the virtual clinic at home, thereby reducing the time they need to spend on their medical care and the inconvenience of travelling, finding parking and taking time off work etc. The patients will be integrally involved in the final project and therefore will be major contributors with a high likelihood of benefiting from it. However, they will not be involved in the planning, performance or evaluation of the project and so would not be key influencers of it.

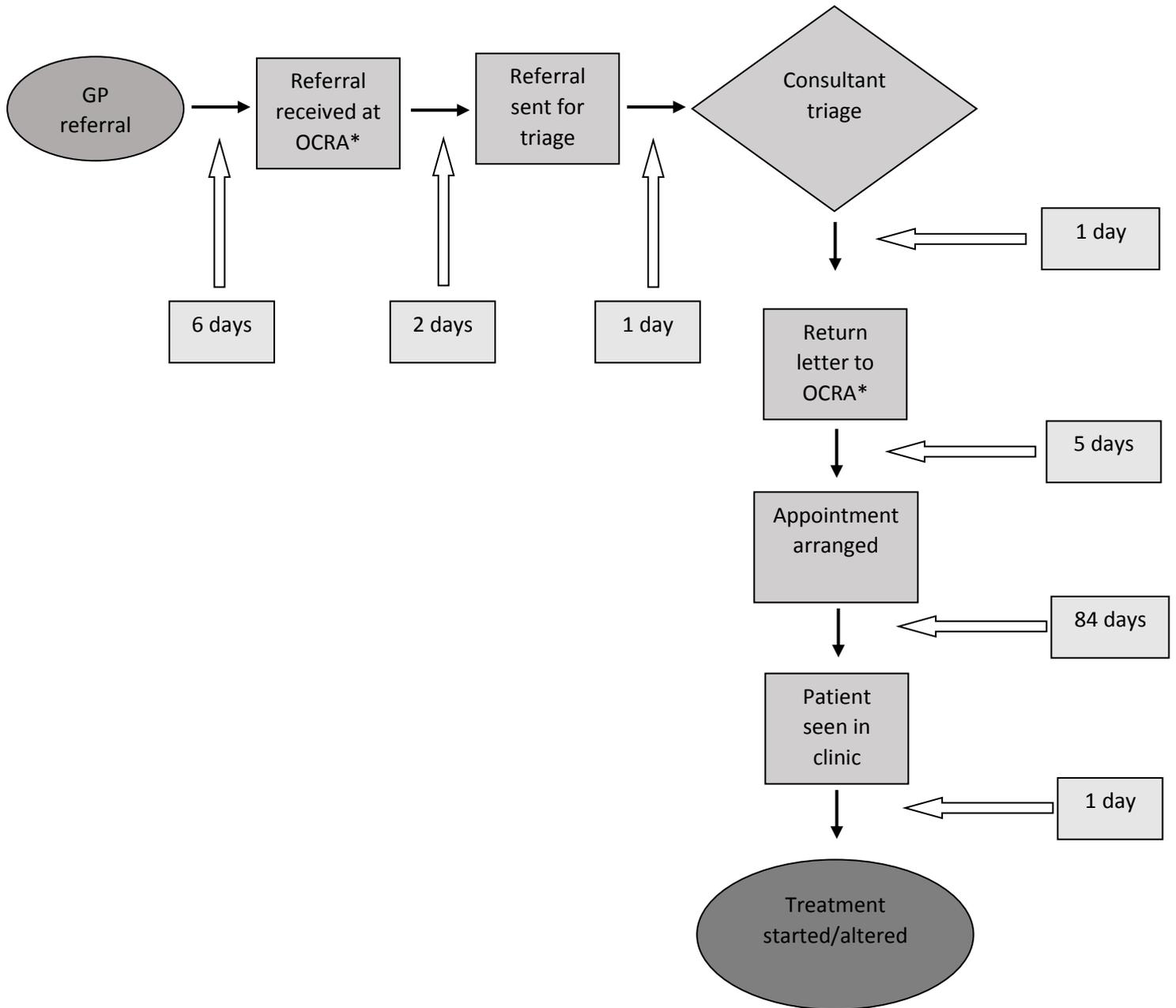
The medical team is also a stakeholder. Careful selection of patients suitable for the virtual clinic will mean that more of the patients can be managed by the consultants so that they can provide expert treatment for the patients more expeditiously. By taking a number of return patients out of the existing clinics, it should be possible to reduce the number attending clinics leaving more time to deal with those patients who are more complicated and need to be seen face to face. This should also reduce the stress to which the team is exposed in trying to manage a large cohort of patients in an afternoon clinic which frequently and currently extends beyond the scheduled time due to the large number and complicated nature of the patients. As a key contributor to the project, the medical team will have high involvement, interest and impact on the project. As their patients will stand to benefit, they will be key

promoters of the project, which will potentially have a high impact on them in terms of how they deliver their service.

The fact that a greater proportion of patients will be managed by the consultants in the virtual clinic should also mean that they will be managed more efficiently. This provides the potential to minimise number of unnecessary referrals. Furthermore, it would be expected that under consultant guidance, the patients will reach the stage of being clinically stable more rapidly; this has the potential to cut down on expenses due to medications and clinic visits. Therefore, the health service in general is a stakeholder in this project as it stands to be cost-saving in terms of resources. Previous studies of virtual clinics, albeit in different areas of medicine and surgery, have demonstrated cost-effectiveness (Mark, 2011, Bellringer, 2017). This does of course remain to be demonstrated for thyroid dysfunction. Therefore, the management of the hospital and the health service in general will be stakeholders in the project with their roles and contributions thought to be as outlined in Table 2 above.

3.5.1.2 Process Maps

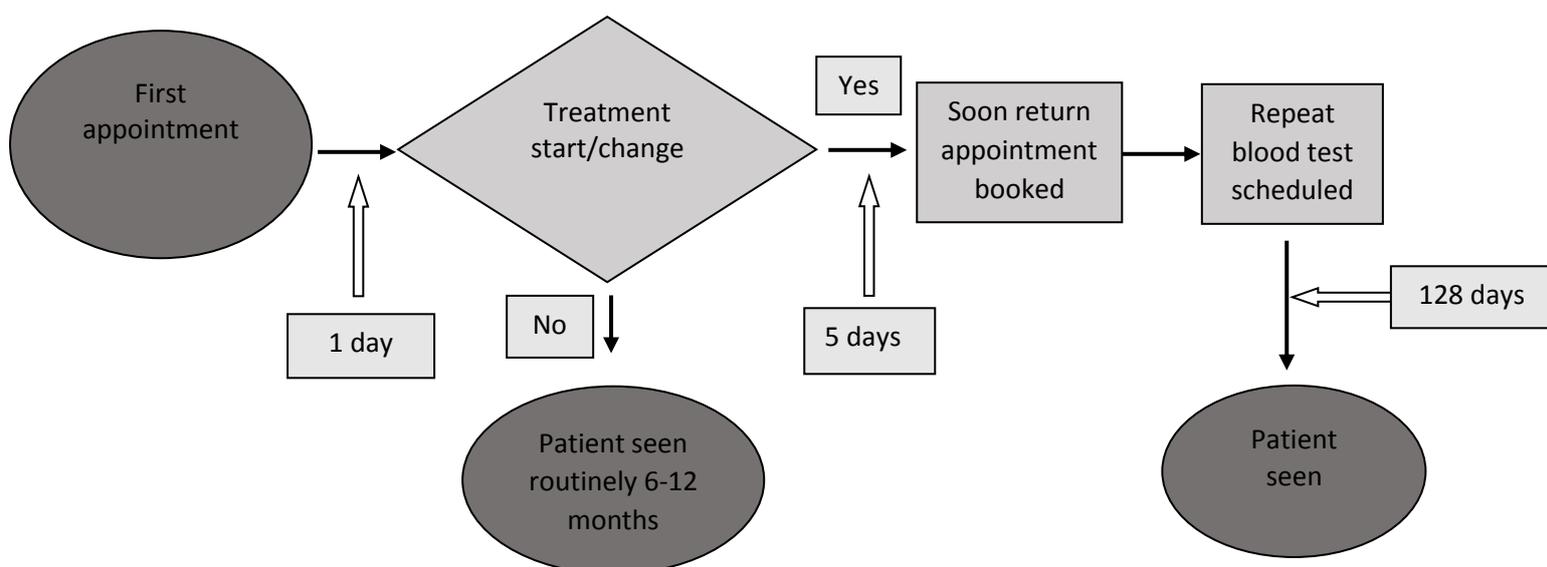
Figure 1. Flow chart for initial referrals to the Endocrine Out-Patient-Department (OPD) indicating stages of the referral process and approximate timelines involved (OCRA = out patients centralised referral area).



By designing this process map, together with the endocrine team at the hospital, I was able to identify several potential factors that may be contributing to the delays in new patients being seen. Some of these factors related directly to the pathway of referral as outlined in the above flow chart or process map. For example, there could be delays in the referral letter being received by the hospital, in the triaging of the letters by the consultants or in finding an available appointment once the letter has been triaged. The potential contributors to the delay in people being seen will be reviewed in more detail below in the Measure stage of the DMAIC.

For return patients as outlined in Figure 2, the pathway is less complex but nonetheless, there can be delays in patients being seen. Once patients have had their initial visit, a further visit is scheduled. If the patient is stable, this will be a routine appointment in 6-12 months. Usually these appointments can be scheduled as slots are available at that remove from the initial visit. However, for the more complicated patients who require to be seen sooner, an issue arises. The next available appointment is usually 12-14 weeks remote from the initial appointment and as patients who are having their treatment introduced, or modified, require to be seen within 6 weeks, these patients cannot be seen within the recommended time span.

Figure 2. Flow chart for return visits to the Endocrine OPD indicating stages of the process and approximate timelines involved.



3.5.2 Measure

Measures are an important component of quality improvement. Without the ability to measure the impact of an intervention, it is not known whether or not it is working. The domains of quality can be used to measure improvement, i.e. by identifying one or more of the domains that is not meeting quality targets and addressing this. If waiting time for appointments is taken as an example, this is a measure of timeliness and it is something that can be re-measured easily after an intervention to determine whether or not it is effective. It is therefore an outcome measure. The process by which expected outcomes are to be achieved – the quality improvement intervention – may also be measured to determine whether it is an appropriate way to achieve the desired aim. Finally, the downside of an intervention - knock-on effects or balancing measures, need to be considered. For example, in a system with finite

resources, reallocation of a resource from one component of the system to improve it, could have a knock-on effect on other components of the system. The focus of this project is mainly on timeliness of health care for patients with thyroid dysfunction as the main outcome measure. The processes involved in providing timely care for these patients and whether or not any change that is suggested is an appropriate process. Finally, balancing measures will need to be considered, although these may be difficult to quantify.

There are few data regarding the quality of care for patients with thyroid dysfunction. However, there are international guidelines for how often patients with thyroid dysfunction should be seen. For patients with hypothyroidism, they should be seen within 3-4 weeks after commencement of treatment or following a change in dosage. For patients with hyperthyroidism, they should be seen within 2-6 weeks of commencement of treatment or following a change in dosage. Frequently, and particularly with hyperthyroidism, GPs may not be comfortable to treat or have appropriate skills to manage them appropriately. Indeed, the Royal College of Physicians recommends that patients with hyperthyroidism are to be referred for specialist opinion (Royal College of Physicians, 2017). Therefore, specialist opinion is frequently required. By analysing waiting time data from the hospital out-patient appointments, in February 2017, I determined that the average waiting time for a new patient referral was 14.4 ± 4.9 weeks (mean \pm standard deviation, $n=12$ observations, over an 18-month time period) and for return patients was 7 ± 4.4 weeks (see run chart, Figure 3). These data were generated by reviewing the 6-weekly clinic schedules sent by the appointments administrator to the endocrine consultants, outlining the number of available appointments over the subsequent 6

months. Clearly, given these numbers, it was not possible over this time period studied for the specialist service to see patients with thyroid dysfunction who, may or may not have been commenced on treatment in the community, in a timely fashion.

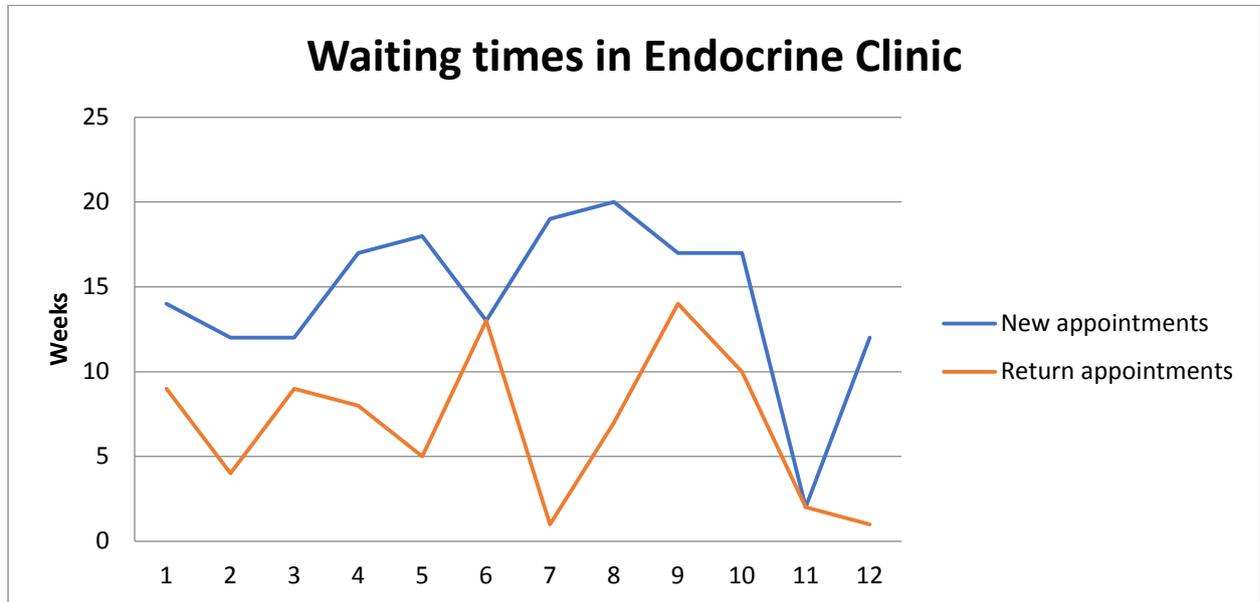


Figure 3. Waiting times for new and return appointments in the endocrine clinic at 12-time points over 18 months up to February 2017.

By reviewing the process map in Figure 1, the following potential contributors to the delay in new patients being seen were identified: delays in the letters being received; delays in the letters being send for triage; delays in triaging; delays in returning letters following triage; delays in scheduling the requested appointments; delays in patients being seen due to the lack of available appointment times.

To determine the extent to which each of the stages in the process map (Figure 1) impacted on the time from GP referral to the patient being seen, a representative sample (n=15) of patients referred for a first patient visit over the 6 months was reviewed (Table 2).

Diagnosis	Female	Male	Total
	12	3	15
Hyperthyroid	6	1	7
Subclinical hyperthyroid	1	0	1
Low TSH	1	1	2
Hypothyroid	4	1	5

Table 3. Data on sample of new patients referred to the Endocrine Out Patients Department in 2017. The data support the fact that, prevalence of thyroid disease is more common in women than in men as indicated in Chapter 1.

Having reviewed this cohort, it became obvious that a very clear and consistent pattern emerged and therefore, it was not deemed necessary to extend the sample. Of these patients, 12 were female and 3 male, indicative of the known preponderance thyroid disease in women. Seven of these cases were patients with confirmed hyperthyroidism, five had confirmed hypothyroidism, one had subclinical hyperthyroidism and two had “low TSH” which may well also have been due to hyperthyroidism. As it can be seen from the histogram below (Figure 4), by the far the longest delay was between the triaging of the letter by the consultant and the patients’ appointments in clinic. The mean \pm SD delay between the GP sending the letter and the letter being received by OCRA was 6.2 ± 4.3 days. The delay in the letter being received by the consultant was shorter (3.5 ± 1.9 days). The consultant turned the letter around very quickly by triaging it within one day of receipt and returning it to OCRA within 1.13 ± 0.5 days. However, from the date that the letter was sent back to OCRA until the patient’s appointment was on average 83.8 ± 33.2 days. Clearly, if this delay is to be improved, the period of the pathway that needs to

be addressed is that between triaging of the letter by the consultant and the scheduling of the appointment.

Days

To receipt at OCRA To receipt by doctor To triage Return to OCRA To appointment

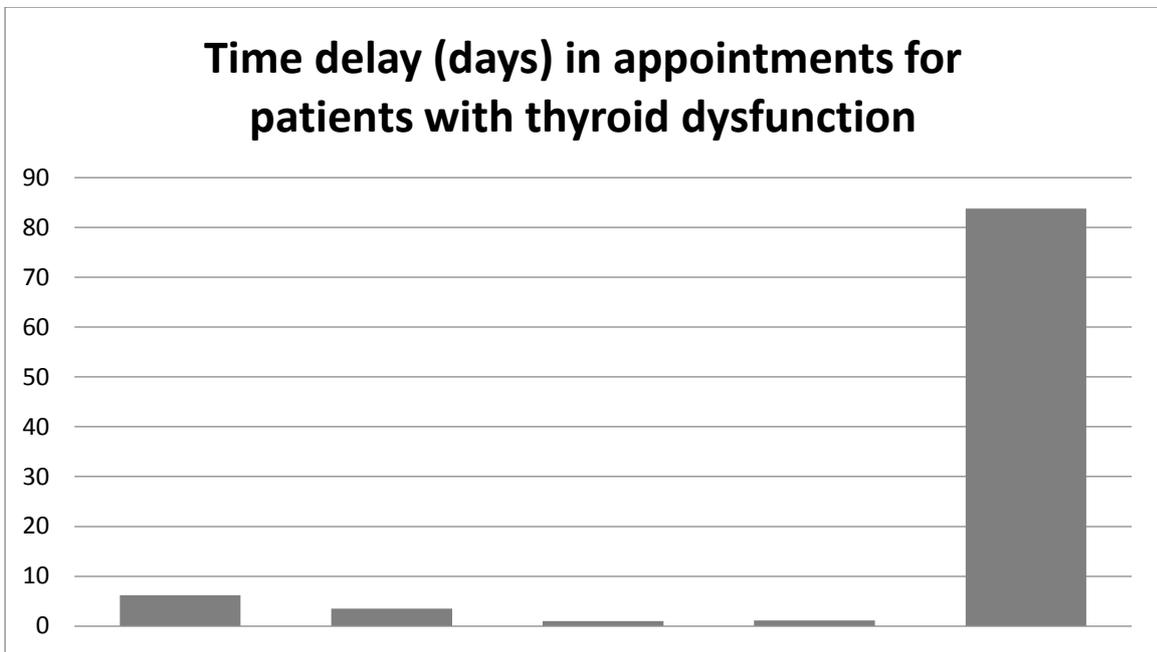


Figure 4. Average time delays in appointments for new patients attending the endocrine clinic with thyroid dysfunction (n=15).

3.5.3 Analyse

Having identified the potential blocks to more rapid review of new patients with thyroid dysfunction, it was important in planning a QI intervention to consider whether there are potential gains to be made by shortening the various stages outlined in the process map (Figure 1).

1. Firstly, there can be a delay of approximately 6 days between the GP sending the letter and that letter being received by the hospital. This would be something that is dependent on the efficiency of the postal service and improving this would be beyond the scope of this project.
2. There can be a delay of approximately 2 days in the processing of the letter in the out patients centralised referral area (OCRA). This is dependent on the efficiency of the administrative staff working in this area. However, as the letter is a paper record in most cases it could also be lost/mislaid and this could contribute to a delay in the patient being seen.
3. The referrals are sent for triage. Currently, this process involves providing the referral letters to the consultants in clinics on Mondays and Thursdays each week. Since this process occurs just twice a week, it could result in delays but in theory letters should be sent for triage within a maximum of 5 days from the receipt of the referral (e.g. a letter received on Wednesday afternoon may arrive too late to be sent for Thursday triage but could be sent on Monday). On average the delay is 4 days. However, as most public holidays are on Mondays, a number of clinics each year are cancelled and this could add a

further delay of 3 days in letters being received for triage but realistically this delay should not exceed 8 days (Wednesday of one week for receipt to Thursday the following week to be triaged).

4. Consultant triage of the letter is variable. Some consultants triage the letters at clinic and return on the same day. It is the practice of other consultants to take the clinic letters from clinic and triage in his office, protecting clinic time for seeing patients. This could result in a delay in the letters being returned to the OCRA but usually this delay is no more than 3 or 4 days as that consultant usually returns the letters latest on the day of the subsequent clinic and frequently does so earlier.
5. The referral letter is returned to OCRA and the secretary schedules the appointment. This process is hard to quantify. Following discussion with the OCRA staff, it was clear that this process was short with most appointments being scheduled within one week of receipt of the letter back in OCRA.
6. The patient now has to await for an appointment in the clinic. Once scheduled, a letter is sent to the patient informing them of the date of their appointment. When an appointment is scheduled, it is very unlikely that an alternative date would be given. Occasionally, GPs may contact the team expressing their concern that the patient needs to be seen more urgently. However, this would be a rare occurrence and once the appointment is scheduled, usually it occurs on the set date, unless the patient fails to attend. The time between when the appointment is arranged and the patient is seen is usually the longest part of the entire process, measuring on average 84 days, and therefore contributes most to the delay. As such, it is therefore also

the period of the process that is most likely to be amenable to improvement.

This component of the process formed the focus of this QI project.

One of the most useful ways to consider the factors contributing to a problem is to design a fishbone diagram. This is done by identifying the issue and then placing the problem at the head of an arrow. Then contributory factors to the problem can be considered under various headings, each playing a small role in the causation of the main problem. It allows thinking under various headings to be considered and unknown causes may be identified by considering the potential causes of healthcare-related quality issues under headings such as manpower, environment etc. There were several factors that were felt to contribute to the delay in patients with thyroid dysfunction being seen in a timely manner but which did not relate directly to the components of the referral pathway outlined above. To try to understand these additional issues, a fishbone diagram was created (Figure 5).

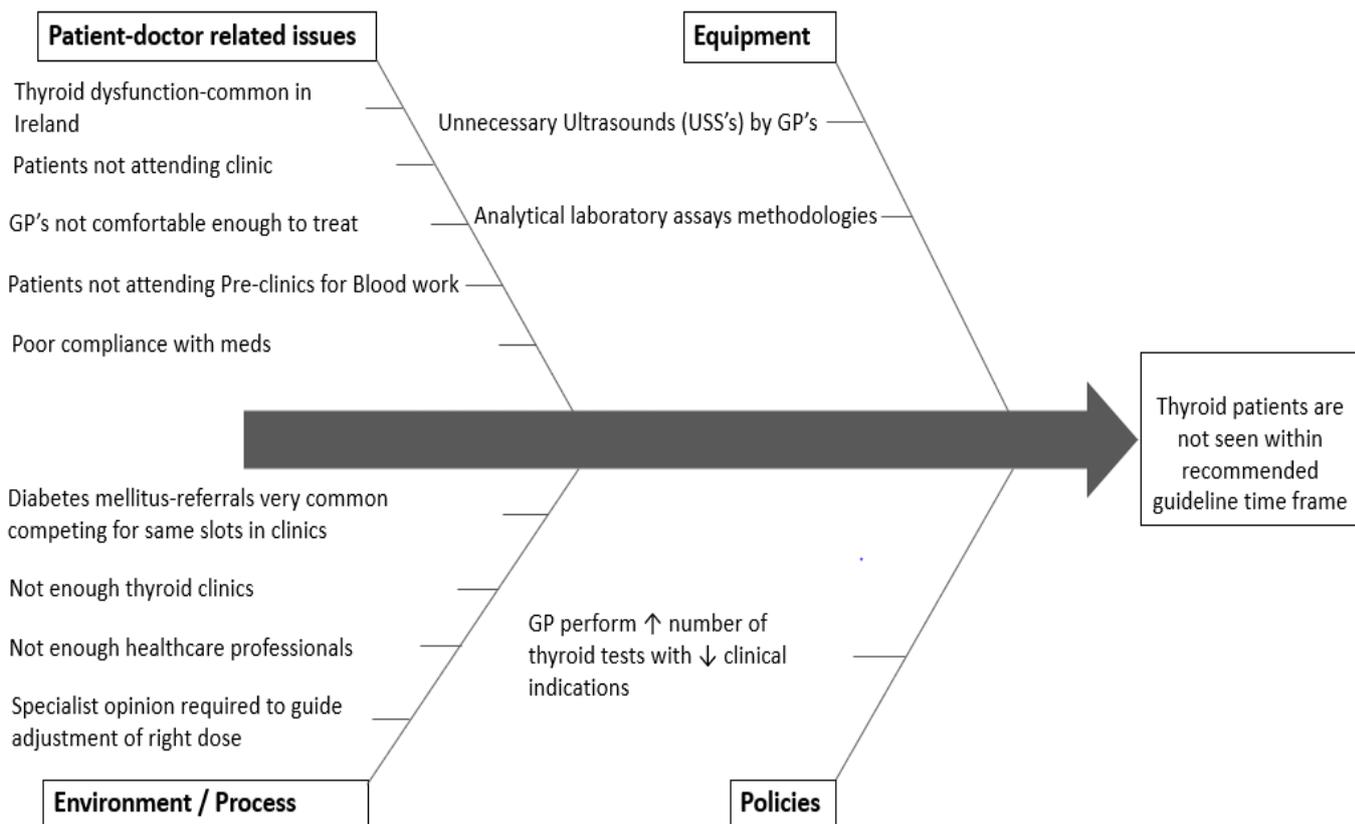


Figure 5. Fishbone diagram designed to facilitate determination of the root cause of delay in patients with thyroid dysfunction being seen.

In this fishbone diagram, which I designed in conjunction with the endocrine team in the hospital, the factors that we assume are impacting on the delay in patients attending specialist thyroid services were divided into: “Patient/doctor related” or “people” issues; equipment; environment and policies. It has allowed us to identify many contributory factors that can be investigated further to attempt to improve quality such as increasing the number of doctors on the team, better education of GPs regarding thyroid diseases and better education of patients regarding the need for regular medical attendance and compliance with medication.

Patient-Doctor related issues:

A number of these were identified. As outlined in the introduction, thyroid dysfunction is common in the community. Therefore, a lot of patients will require specialist opinion to address their issues. While the reasons behind this are complex, and our current understanding of the aetiology of thyroid dysfunction is that it is usually due to a combination of a genetic and environmental factors such as viral infections, there are no easy ways to reduce the number of patients presenting with the condition so this is essentially a non-modifiable factor.

From discussions that the consultants have had with GPs, it is clear that they are not all comfortable with managing thyroid disease, especially in the case of hyperthyroidism. Hence, there is a large number of referrals of patients for specialist opinion and as outlined in the above sample of recent referrals, patients with hyperthyroidism predominate. It is understandable that GPs may not feel competent to manage thyroid dysfunction as their role is to be a generalist rather than a specialist. However, their level of competence could be improved through education of GPs by the specialist team.

Patient-related issues include the fact that patients do not attend for scheduled clinic appointments and therefore block other patients from attending sooner than they do. From discussions with the endocrine team, it is clear that usually about 20% of appointments at any one clinic are “DNAs” i.e. did not attend. On the face of it, this is a contributor to the delay in patient appointments for thyroid dysfunction that should be modifiable. However, since the proportion of patients that do not attend is fairly consistent despite measures taken by the administrative staff, which include

sending out text reminders, the endocrine team has accepted this and built that into their scheduling. In effect this means that, they realistically can see 40 patients in an afternoon clinic but 50 patients will be scheduled for clinics in the knowledge that 20% are likely not to attend. Other patient-related factors such as not presenting for laboratory tests in advance of clinic visits and not adhering to treatments can also impact on waiting times, in particular for return appointments. Data for these factors are not routinely recorded but discussion with the endocrine team revealed that they are fairly regular occurrences. Difficulty with compliance to anti-thyroid medication is well described (Cooper et al, 1985). If patients do not have up-to-date blood work when they are seen, the team will organise for blood tests to be done on the day of the clinic and then the patient will usually require an additional appointment for follow up of the results. It is also worth mentioning, since adherence with medication is not 100%, patients' thyroid dysfunction does not come under control as quickly as it should in some cases and these patients then require earlier appointments contributing to the bottleneck. These factors are theoretically modifiable but since they would involve behavioural changes and since patients' beliefs regarding taking medication and clinic attendances are impacted by varied and complex attitudes, changing them would be challenging and resource intensive.

Environment/process

In considering the environment and processes that affect clinic waiting time, a number of issues arose. Firstly, there are patients with many other conditions

competing for appointments with the Endocrine service. Since most of the patients attending the service, have diabetes, a condition that is increasing in prevalence with a current worldwide prevalence of 415 million and an estimated prevalence in Ireland of 172,000 or 4.4% (Irish Diabetes Federation, 2017), this makes it difficult for the Endocrine team to protect appointments for patients with thyroid dysfunction. This would not be an easy issue to address in terms of its contribution to the delay in patients being seen for appointments in the thyroid clinic.

The other main issue in this category relates to resources. The Endocrine team is relatively small with two consultants, two registrars, two senior house officers and two interns. Additionally, since the team contributes to the on-call general medicine service and it is mandated that team members are compliant with the European Working Time Directive (EWTD) which means that they should not work more than an average of 48 hours per week (European Commission, 2003). Due to these competing factors (EWTD and on-call duties) not all team members may be available for clinic. Attempts to improve the waiting time for patients by increasing the number of team members available would be resource and cost intensive. The level of resources in terms of clinic frequency is also an issue. As the Endocrine clinic takes place once weekly and since only two clinics per month are dedicated for patients with thyroid dysfunction, there are a limited number of slots available to schedule return patients with hypo- or hyperthyroidism. This issue could be ameliorated by increasing the frequency of thyroid clinics, although this could also require significant resourcing.

Equipment

Under this category, a couple of issues arose. One relates to thyroid ultrasounds. The greater availability of ultrasound machines and the accessibility of thyroid ultrasound for GPs has led to an increasing rate of referral of patients with thyroid nodules. It has been demonstrated that, while thyroid nodules are palpable in 7% of the general population, they can be diagnosed in up to 67% of the population if studied using ultrasound (Burman and Wartofsky, 2015). In addition, very few of these nodules ~ 1 in 10, contain cancers (Burman and Wartofsky, 2015). A review of referrals to the Hospital has shown that a large number of thyroid ultrasounds were requested inappropriately. Screening of scan requests could cut down on this number and therefore reduce unnecessary referrals (Davenport, 2017). This would require restricting access for GPs to ultrasounds or providing guidance for GPs for appropriate use of ultrasound scanning of the thyroid. While this could be done at the public hospital, there are now several private institutions offering ultrasound scanning at reasonable cost, so this would be unlikely to resolve this contributor to the delay in appointments completely.

The laboratory equipment is another potential contributor to the delay in patients being seen. Occasionally thyroid testing of patients provides discordant results. In other words, a patient may present with an elevated thyroid hormone level but a normal TSH. The expected finding in the setting of an elevated hormone level, is that the TSH should be suppressed. If this is not the case, there are a small number of clinical conditions, such as thyroid hormone resistance or a pituitary tumour secreting TSH, that could account for the finding. It is more likely that there is some interference in the assay which explains the finding. However, the patients need to be seen and assessed both clinically and biochemically and usually the testing is

repeated both in the local lab and a second laboratory in a different hospital that uses a different testing platform (Koulouri, 2013). In most cases, the patient is found to be clinically and biochemically euthyroid indicating that an unnecessary referral was made to the clinic. As this is a relatively uncommon occurrence, addressing any laboratory-based issues would be unlikely to impact significantly on delay in patients with thyroid dysfunction being seen in clinic.

Policies

Finally, under policies, the issue of GPs performing an increasing number of thyroid function tests without definite indications was considered. Although there is little work done on this in Ireland, data from other countries has shown that thyroid function testing is often performed without definite indications (Chami et al, 2017; Lin et al 2017). Anecdotal experience in the clinic is similar. Many patients are referred because of (often subtle) thyroid function test abnormalities that are not related with clinical symptoms or signs. This may be due in part to the fact that thyroid testing has become considered to be a routine blood test. It may also be in part due to the fact that fatigue is a very common symptom in general practice and thyroid function abnormalities can be associated with fatigue. This issue could be addressed by introducing guidelines for thyroid function testing to guide GP's so that testing could be performed in the most appropriate cases only. In 2016, the National Clinical Programme for Pathology introduced guidelines for thyroid function testing in primary care (Boran et al, 2016). Although all GPs may not be fully compliant with these guidelines, in a sense, this contributor to delay in patients being seen has already been addressed.

3.5.4 Improve

3.5.4.1 Overview of QI Plan

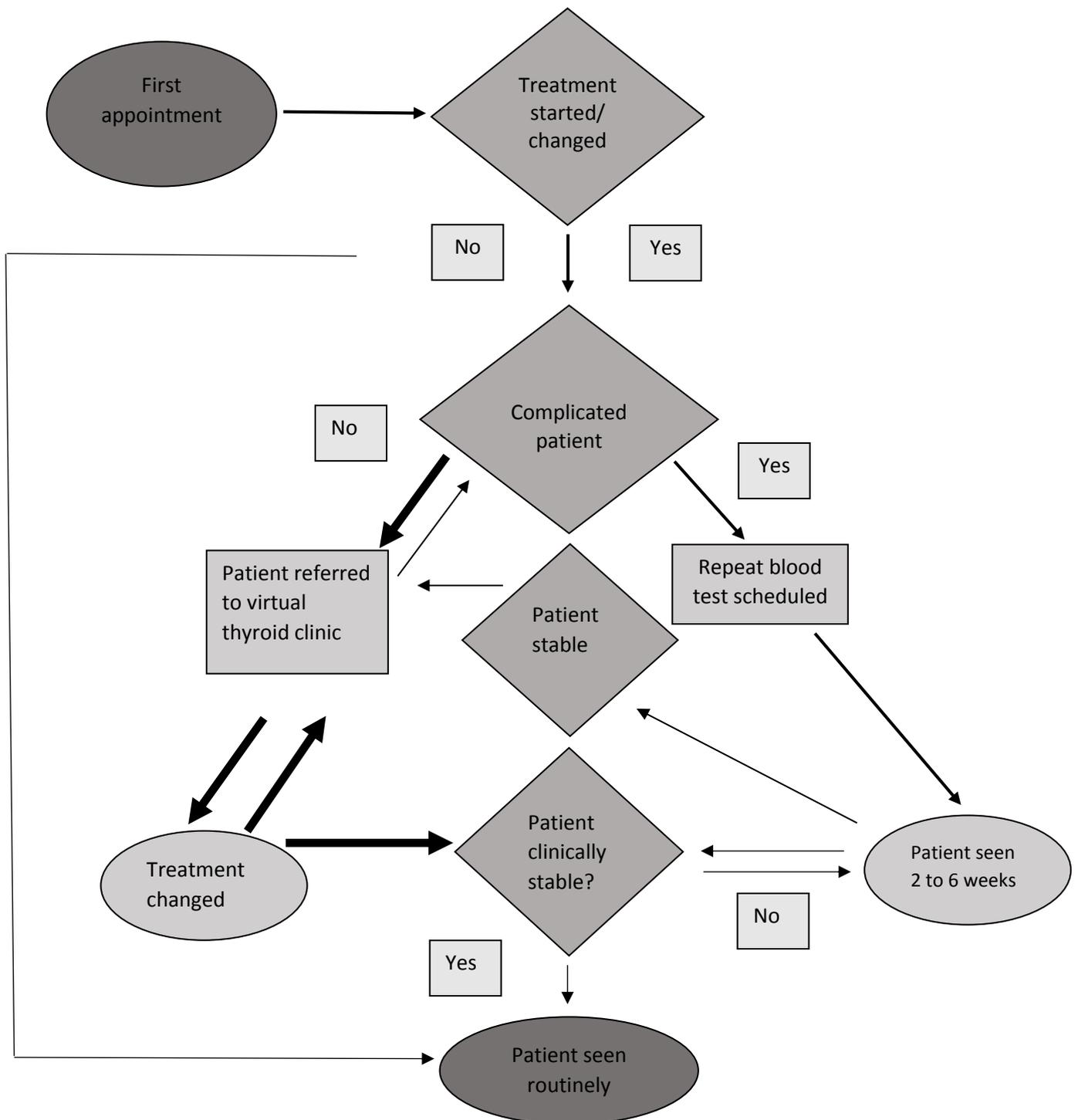
The factor that contributes to the delay in patients being seen which we thought would be most worthwhile addressing was the number of clinics. While setting up an additional fully staffed clinic would be very resource intensive, involving administrative, nursing and medical staff, the concept of a virtual clinic at which patient information could be reviewed including medication, clinical testing results reviewed and an appropriate specialist opinion provided, is one that could help ameliorate the waiting time for specialist opinion. Such a clinic would not necessarily need to take place weekly. In the first instance the intervention, the 'Do' phase of the PDSA cycle, would be to set up a monthly virtual thyroid clinic, delivered by consultants, at which, initially, return patient tests and medication could be reviewed and a plan communicated to the patients' GPs. Baseline data on waiting times is already available. It is anticipated that the aim of shortening the wait time for a specialist opinion by two weeks over the first year is achievable using this approach. Since the average wait time for return patients is 6-8 weeks it was felt that a monthly virtual clinic would be needed to reduce that wait time. If in due course this intervention was proven to be successful, it could be extended to include new patients, although a two-monthly clinic might be sufficient to shorten the wait time for new patients, which is 12-14 weeks.

It is likely that it will take some time before consultants will feel more comfortable in reviewing patients at virtual clinics. In the first instance therefore, it is not suggested to have new patients attend the virtual clinic but rather to restrict it to patients who have already been seen at least once, face-to-face. This is deemed to be important

since there is a lot of information that can be picked up in personal consultations that would not be evident without the one to one interaction. Not seeing the patients would prevent the medical team from picking up on any information gaps that might exist in the referral letter from the GP, either because the GP has not included them, the patient may not have divulged them or the doctor may not have asked the appropriate questions, since her/his expertise in the area is less than that of the consultants. In addition, a lot of information can be inferred from non-verbal communications when the doctor meets the patient directly. Therefore, in the initial stages of setting up a virtual thyroid clinic, it is proposed that this would see return patients only for a period of time (see proposed outline in Figure 5). The possibility of referring new patients to the clinic will be addressed at a later date.

3.5.4.2 Design of intervention

Figure 6. Flow chart for the proposed referral pathway to virtual and actual clinics.



This pathway was developed following consultation with the endocrine team and having reviewed the format of other virtual clinics including the virtual thyroid clinic at the Royal Berkshire Hospital Trust. It refers to patients that have been seen at least once in the clinic face to face with the consultant. Patients with hyperthyroidism or hypothyroidism will be seen by the consultant and a change may or may not be made in their medication. In some cases, they may be started on therapy for the first time. For those who are stable and do not require commencement or change of treatment, they can be seen on a routine basis. Such appointments may not need to take place for 12 months or so. In the cases of patients where treatment is started or changed and who require review in 2-6 weeks, the vast majority of those will be seen in the virtual thyroid clinic as represented by the thicker arrows in Figure 5. This will be the case if the patient is deemed not to be complicated. The virtual thyroid clinic will be delivered once monthly by one of the consultants and at the clinic the patient's chart and previous letter will be reviewed, their current lab tests will be available and the consultant will make a decision regarding whether or not they can continue to attend the virtual thyroid clinic. Patients can re-attend the virtual clinic a number of times until their condition has stabilised. In the case of those who remain uncomplicated they will continue to attend the virtual clinic until their condition is stable at which time they will revert to the routine follow up at a later time point, be it 6 or 12 months down the line. Patients who were initially uncomplicated may become complicated at a later timepoint and in this case, they can be referred to the main clinic for a face-to-face consultation with the consultant.

Some patients with thyroid dysfunction may not be suitable to be referred to the virtual clinic following initial consultation. For example, patients who are pregnant

need very close monitoring of thyroid function to ensure optimal health of the mother and the baby (Alexander et al, 2016) and should have thyroid testing performed once every four weeks. Although in theory this could be performed in a virtual clinic, the potential impact of adverse events during pregnancy makes it possibly less safe to follow in this manner. In addition, some patients with hyperthyroidism may have difficulty in tolerating anti-thyroid medication. For example, agranulocytosis is an uncommon but potentially very serious side effect of anti-thyroid drugs. In addition, liver toxicity is documented, in particular with propylthiouracil. Therefore, patients with intolerance to medication may require more careful and close monitoring that may not be possible in the context of the virtual clinic. Other patients who may be deemed to be complicated would include those with severe hyperthyroidism or hypothyroidism with significant end organ involvement for example hyperthyroid patients with atrial fibrillation or heart failure. Patients referred for a first visit who are known to be complicated should not be referred to the virtual clinic (at least in the first stage of its introduction) but should be referred for a soon appointment with the consultant face to face. This decision will be at the discretion of the consultants. In addition, it will be necessary to transfer some patients who are allocated to virtual clinic follow up to the usual clinics in the event that they develop one of the indications that makes them complicated. Therefore, there is a two-way flow between the virtual clinic and the actual clinics in the above diagram but the fact that most of the patients are expected to be uncomplicated and the flow from virtual to actual clinic for complications would be unusual is reflected in the thickness of the arrows.

For complicated patients, they will continue to attend the actual clinic in the usual way. It is anticipated that by streamlining a majority of the patients into the virtual clinic, appointment slots will be freed up to allow the complicated patients to be seen in a more timely manner in the actual clinic. Patients who start off as being complicated may also become less complicated e.g. a pregnant woman who delivers her baby or a patient who had a reaction to one anti-thyroid medication but tolerates the second one well. These patients can be streamlined back either to routine referral or if they are still in an active phase of their management where further dose changes may be required, they can be referred also to the virtual clinic.

3.5.4.3 Design, procedure and outcome of interventions in virtual clinic

Patients referred to the virtual clinic will not receive a face-to-face consultation but the recommendations of the consultant delivering the clinic need to be communicated to the patient. Prior to completing their initial visit, the consultant will determine whether or not they are appropriate for follow up in the virtual clinic. In the event that they are to be seen at the virtual clinic, the patient will receive notification of the date that their case will be reviewed and be informed that they will be required to present for repeat blood testing the week before and that they should be available by phone on the day of their virtual clinic appointment. Patients who do not present for their blood test as directed will be referred back to the actual clinic. For patients who do present on the day of the clinic, the consultant will review the up to date information regarding the patient which will include: the previous clinic letter to provide the clinical context, diagnosis etc; the current lab results and the patient's current medications. A proforma will be used to facilitate the consultations (Appendix 1). At the end of the clinic the consultant will call the patients to communicate the

changes that are required in their medication and will inform them of whether they are to remain attending the virtual clinic or to be referred on to the actual out-patient clinic. In the event that the patient does not answer their call, they will be called one more time prior to the end of the virtual clinic and if again they do not answer their call, a letter to the patient will be dictated giving them clear instructions on what change if any is to be made in their treatment and this letter will be typed by the secretarial staff as a matter of urgency. A letter will be sent to the patient and their GP in all cases though if the care plan has been communicated to the patient by phone already, the urgency with which the letter is typed will be less.

3.6 Summary

In summary, there are a variety of approaches that can be taken in carrying out a quality improvement project. These are broadly similar and as long as they contain the central component of QI – identifying a problem, understanding it, instituting a change that can be measured and analysed, refined if needed and then applied to promote change, the exact method does not really matter. I have used a DMAIC approach incorporating a PDSA cycle in this project to attempt to promote change leading to improved quality of care for patients with thyroid dysfunction. By using a process flow map, the potential contributors to delays in new patients being seen were identified. By measuring the contribution of each of these to the delay, it became clearer that by far the main contributor was the waiting time for the patient to be seen once the appointment was scheduled. By analysing whether stages of the process could be shortened, it was clear that shortening this stage was also likely to result in the most gain in terms of patients being seen more rapidly. The plan to

develop a virtual thyroid clinic is designed to improve the time within which the patients are seen, thereby improving the timeliness, efficiency and effectiveness of their care. In the following chapter, the approach to evaluation of the effectiveness of the QI intervention will be considered.

Chapter 4: Evaluation

4.1 Introduction

In this chapter the processes for evaluation of the quality improvement intervention will be discussed. The potential impact of the intervention and how it may help improve the quality of service for patients with thyroid dysfunction attending the clinic will also be discussed and the possibility of extending the intervention, if successful, to incorporate other groups of patients will be considered.

4.2 Background

As it can be seen from the data presented in the previous chapter, the referral process is fairly complicated and there are several steps involved. Although some of these are associated with relatively short delays, it was clear from the data that by far the largest contributor to the delay (more than 80% of the delay) is the time spent waiting on an appointment once the visit has been scheduled (Figure 3). This therefore represented the best opportunity to make a change to improve the timeliness of the appointments. Accordingly, the intervention to set up a virtual thyroid clinic was suggested to improve waiting times.

4.3 Domains of quality addressed by the intervention

It is anticipated that this virtual clinic will shorten the time within which patients can receive appropriate management for their thyroid conditions. Therefore, the timeliness of care will be improved. It is also anticipated that the efficiency of care will improve. By focusing the consultant on the current patient's thyroid function status and their current medication, there will be a greater emphasis on the issues that the patients were referred for. Consequently, the consultants will be able to

advise about a larger number of patients in a shorter period of time, thereby increasing their efficiency. It is also anticipated that the safety of care will improve. Currently, if patients call between appointments for follow up of testing they will usually speak with the intern, the most junior member of the team. The intern may advise the patient or may seek help from a more senior team member. However, in the setting of a consultant delivered virtual clinic, the advice will come from the most qualified member of the team who is most up to date with the current literature and guidelines and for that reason the safety of care is likely to improve. Also for these reasons, the effectiveness of patient care is likely to improve. Therefore, this intervention has the potential to impact on several of the domains of quality of care provided to patients with thyroid dysfunction.

4.4 Evaluation, monitoring and review

The outcome measures for this intervention will be the average wait times for new patients and return patients at the thyroid clinic. These data can be provided by the waiting list office in the hospital. This office regularly compiles data for the clinical team to benchmark their waiting times against national recommendations. These wait times will be documented monthly for one year after introduction of the change and will be compared to those at baseline in February 2017, to determine whether or not the intervention was successful – part of the study phase of the PDSA cycle.

4.4.1 Expected results

It is expected that this intervention should shorten the waiting time for return patients attending thyroid clinic by at least two weeks over the first year. However, the

evaluation will provide the actual results to quantify the impact and inform the “act” component of the QI project.

While the new patients are currently waiting longer than return patients for appointments, return patients comprise on average 80% of attendances at the clinics. Clinic data for 2016 demonstrated that 320 of 1882 (17%) attendances at the endocrine clinic were new referrals. Therefore, a change that streamlines the process of seeing returning patients is likely to have a more significant impact on waiting times for new referrals by freeing up slots in the clinic and enhancing the new patient to return patient ratio from its current level of 1:4 approximately, to closer to that recommended by the HSE of 1:2 (HSE, 2016) for the thyroid clinics.

4.4.2 Evaluation

As part of the evaluation component of the project, it would be important to get some qualitative feedback from the consultants delivering the clinic and also to determine how effective they felt that the intervention was and if they had any concerns regarding it. This could also provide some idea about balancing measures e.g. whether or not consultants felt that their time spent in the virtual clinic added to their overall efficiency or whether they felt that it detracted from their other commitments. For example, if they spent one half day attending the virtual clinic, this could impact on their ability to provide other services to patients.

The patients are active stakeholders in the thyroid clinic also and it would be helpful and prudent to determine the patients’ perceptions of attending a virtual clinic. It is suspected that a variety of different responses will be obtained. For younger patients

with busy work schedules, young families and who are familiar with IT, this may be an acceptable mode of delivery of care. On the other hand, more elderly patients who are used to direct contact with their doctors, may be less comfortable with virtual clinics.

The hospital management and administrative staff are also stakeholders in the process of referrals to the clinic. It is important to the hospital to keep waiting times down in line with national policies (HSE 2016) and therefore the virtual clinic may be seen by the hospital management as a more effective means of delivery of care to their patients. From the point of view of the appointments staff who are constantly challenged to provide clinic times for patients and who are often the first point of contact from concerned patients as they wait long times to be seen, the virtual clinic may be positive innovation.

To solicit qualitative feedback from both the doctors, patients, management and administrative staff, a questionnaire will be developed to ask some specific questions regarding the virtual clinic and space will be provided for free text comments as part of the feedback. The feedback from these sources will be used to inform any required refinements of the virtual clinic for the future. This will be part of the Control phase of the DMAIC and the Act phase of the PDSA cycle which in summary is presented below in Figure 7.

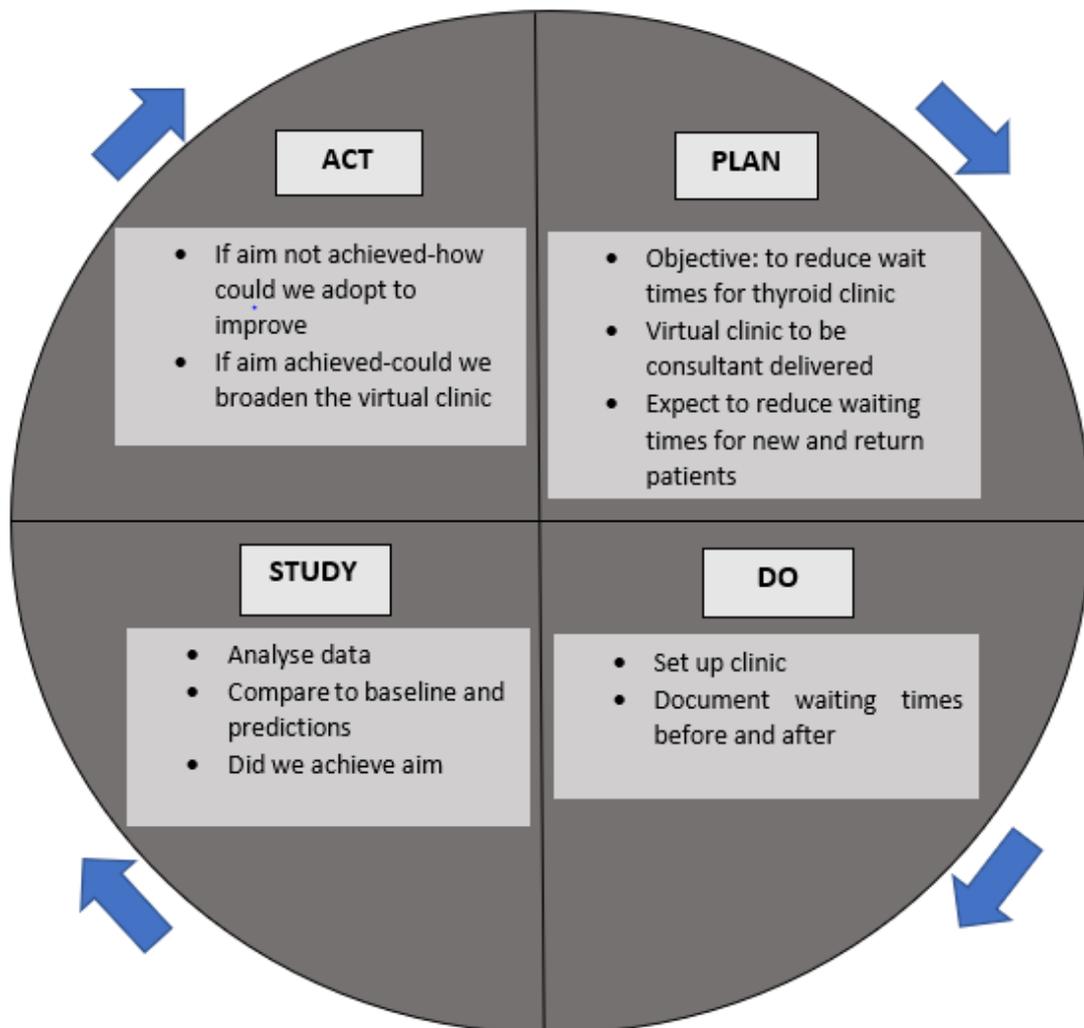


Figure 7. The Plan Do Study Act cycle.

4.4.3 Dissemination Plan

Clearly if the project is not successful, then it would need to be modified and re-tested. Potential reasons for the lack of success would need to be explored in considering potential obstacles. If it was successful, it could be scaled up to impact further on waiting times in the thyroid clinic. This could include widening of the

scope of who is deemed to be uncomplicated enough to be referred to the virtual clinic. It could also be broadened out to include selected other patients with less complicated thyroid structural conditions (nodules) or other less complicated endocrine conditions.

It is planned to submit this project plan to be considered for presentation at the next Irish Endocrine Society annual conference. Once the intervention has been applied and evaluated, it will be re-submitted for presentation at the subsequent conference. If successful, it will also be written up as a manuscript for consideration for publication.

4.5 Summary

In summary, by designing a fishbone diagram, I have identified multiple contributory factors impacting on the waiting time for patients at the thyroid clinic. Many of these are theoretically possible to improve but not without significant input of resources. I propose that my aim of reducing the waiting time for thyroid patients by two weeks over a year can be achieved by introducing a consultant-delivered virtual clinic once a month for patients with thyroid dysfunction. This has an easily measurable outcome measure to determine its success and if successful could potentially be scaled up to further address the problem.

Chapter 5.0 Discussion and Conclusions

5.1 Introduction

In this chapter I will briefly review the project and its context as a lead in to reflecting on how the project plan can impact on the waiting time for patients attending the endocrine clinic with thyroid dysfunction. The strengths and limitations of the project will be considered and recommendations for its implementation and further evaluation will be made. Prior to summing up, the learnings from the QI project will be presented.

5.2 Context of the project

Thyroid disease is one of the commonest conditions seen in general practice and often necessitates specialist referral. Waiting times are often long as seen in this clinic and mitigate against providing care for patients that is in line with international recommendations. In this QI project I have planned a QI intervention aiming to shorten the clinic waiting time for patients with thyroid dysfunction by two weeks over the first year by introducing a virtual thyroid clinic. In designing this project there was little literature available referring to quality improvement for patients with thyroid dysfunction. Having identified the lack of an appropriate number of thyroid clinics as the main driver of the problem, the question was how this could be ameliorated in the most cost-effective manner. However, the concept of virtual clinics is not new.

The proposal for improvement will be similar to virtual clinics which exist for many medical and surgical specialties and their use is significantly expanding (Jayaram et al, 2014 and Mark et al, 2011, Goldfien 2016). However, no literature was found on virtual clinics for patients with thyroid dysfunction. There is a significant amount of

evidence in literature for fracture virtual clinics in orthopaedic surgery for which the implementation was very successful (Athanasopoulos et al, 2017). Some examples of medical specialties which use the concept of virtual clinic include diabetes and kidney disease (Basudev, 2016, Mark et al, 2011).

The main benefit of virtual clinic is that neither consultant nor patient have to be physically present in the clinic. The advantage for consultant is that they can review patients from home or at any time once the information technology support is available, whereas the benefit for the patient is mainly cost-effective. That is, they do not require to take a day off from work, spend time travelling to hospital, paying extra money for parking and fuel. The downside of virtual clinics of course, is that they lack a direct doctor-patient interaction. Therefore, the subtleties of a clinical interaction will be missed and this may impact on expectations of patients. It is not envisaged however that the virtual clinic would completely replace a face-to-face clinical interaction. It is simply a means to get patients started and progressing along on the therapeutic course more rapidly and they would still need to be seen in clinics in the usual manner. As this project proposes to introduce the virtual clinic, at least initially, for returning patients only, all patients will continue to have their initial consultation face to face.

5.3 Project impact

The impact of the project, as envisaged, is that patients will have faster access to specialist opinion for thyroid dysfunction. The main delay does not relate to new patient visits and this proposal does not directly address the relatively long waiting time for initial appointments. When clinic spots in the thyroid clinic are vacated as

patients are referred to the virtual clinic, additional new patient appointment times become available. This shortens the time that new patients wait for their initial consultation.

Clearly this proposal, if successful, will benefit the return patients who will have access to specialist opinion more rapidly and from the consultant. When patients with thyroid dysfunction attend a face to face appointment, they will frequently meet a relatively junior staff member who would not have the expertise that the consultants have and may therefore not manage the patients as efficiently or effectively as their more experienced colleagues. An additional benefit would be that the intervention should free up clinic space also for patients with other endocrine conditions since reducing the number of return visits for thyroid patients makes additional clinic spaces available.

5.3.1 Practice

This project should improve the endocrine service in the clinic by providing appropriate and timely specialist advice at an early stage in the patient journey. As the clinic will be run by consultants, patients will be managed by the experts in their field and this will improve a number of the domains of quality – timeliness, efficiency and effectiveness. The ultimate aim is to facilitate guiding GPs in managing their patients. In the event that the evaluation of the intervention as outlined demonstrates that it is not successful, then it will be re-designed for a future PDSA cycle.

5.4 Strengths of the project

This project has a clear aim which is important in a QI project. It proposes an intervention that is designed to produce a measurable improvement over a defined period of time after the intervention i.e. reducing the time waiting to attend clinic by two weeks over the first year. In this context, there are good baseline data on waiting times with which to compare those after the intervention. Therefore, it should be possible to detect any improvement effected by the intervention with a series of simple measures that are routinely performed anyway by the waiting list office at the hospital.

Using the DMAIC and PDSA approach, a single change is planned that can be evaluated and refined as needed based on the measurements of the impact of the intervention. This is in keeping with the important principles of quality improvement.

5.5 Limitations of the project

This is a QI project plan at this stage so although it does provide a roadmap for a QI intervention, it does not provide an answer to the question as to whether waiting times for thyroid patients would be shortened. In planning this project, it is difficult to allow for unknown variables such as the number of referrals might drop over the course of the year after introduction of the virtual clinic; patients may decline to participate in the virtual clinic, thereby limiting its ability to demonstrate its effectiveness; GPs may decline to refer patients to a service that is running a virtual clinic until there is some level of comfort with it and it has demonstrated its effectiveness. The most reliable way of answering whether an intervention is effective is to carry out a randomised control trial where patients would be randomised to either usual care or the virtual clinic and determining whether their

thyroid status reaches stability in a shorter time. Such an approach belongs to the domain of research rather than QI.

Another limitation of the project is that most of the indications for the need for intervention arose out of informal discussions with the Endocrinology team. While it would have been desirable to carry out a formal needs assessment, this would have required a submission to the local Ethics Committee. However, this was not possible within the time constraints of the project. Another potential limitation of the project is that intervention does require the resources of consultant time. The Endocrine consultants have numerous commitments including General Medicine in addition to their Endocrinology responsibilities. Therefore, this will represent an additional demand on their time, especially in the early stages. However, if a virtual thyroid clinic was introduced and was effective at reducing the wait time for thyroid patients, over time this is a role that could potentially be fulfilled by an Endocrinology nurse or an Advanced Nurse Practitioner or a Physician Associate.

5.6 Recommendations

Currently patients with thyroid dysfunction are not seen in the hospital clinic in a timely manner. In a consultant-led rather than a consultant-delivered clinic, patients may be seen by less experienced members of the medical team who are not so familiar with managing the more complicated patients. It is recommended that a virtual clinic should be introduced which is consultant-delivered so that:

1. Return patients are seen more rapidly and more in keeping with their needs based on their condition, with the minimum possible demand on consultant time.

2. The additional spaces freed up from the existing clinics means that new patients and patients with other endocrine conditions (which are frequently more complicated than those with thyroid dysfunction) can be seen in a timely manner.

The intervention should be evaluated after a period of one year and scaled up in the event that it is effective. For example, consideration of applying it to new patients or developing a similar clinic for patients with structural thyroid disorders or other endocrine conditions.

5.7 Learnings from this QI project

In completing this QI project, I have become familiar with the process of quality improvement and how it can be applied to health care. Reviewing the literature on QI in health care was eye-opening, in particular regarding the need to adopt a QI approach to improve patient safety since errors in health care are so common. I also developed an understanding of some of the ways that telemedicine can contribute to improvements in health care. The concept of a virtual clinic might seem like an obvious solution to some of the difficulties to accessing specialist health care in the current era where information technology contributes so much to our daily lives. However, telemedicine is still in its infancy and it seems that thyroid medicine is behind some other specialties in embracing it. I also found that reviewing the literature on how quality of healthcare is defined in terms of the six domains of quality (Institute of Medicine, 2005) to be an important and useful approach to assessing the quality of care. I plan to reflect regularly in the future on the quality of health care that I will provide as a Physician Associate in that context.

In terms of the tools involved in QI, I feel that I have developed a good sense of what is involved in how multiple factors can contribute to a problem that can impact on quality of care. Careful consideration is required in attempting to identify the main contributors or root cause of the problem. In attempting to drive change I have learned that it is important to have a clear aim and to make small changes that are easily measurable.

5.8 Summary and Conclusion

Thyroid dysfunction is common and many patients with thyroid problems are managed initially or entirely in primary care. However, expertise in managing thyroid disease is required to most effectively manage these patients and in particular those with hyperthyroidism. Currently the clinic is unable to see patients as frequently as indicated by international guidelines, which means that one of the important domains of quality- timeliness- is not being met. However, a number of domains of quality, not only the timeliness but also the efficiency, effectiveness and safety of their care can be compromised. To address this issue, a PDSA cycle quality improvement plan that recommends setting up a consultant-delivered virtual thyroid clinic is proposed. As outlined, it is anticipated that this will enhance flow of patients through their journey, improving the quality of their care with potential benefits also for other patients attending the clinic. This QI project plan includes measures that can be evaluated to determine its effectiveness or otherwise. Specifically, it is anticipated that the intervention will shorten the waiting time for patients attending the clinic with thyroid dysfunction by two weeks over the first year. The potential outcomes and balancing measures, that is the potential downsides of the intervention, have been

considered. The project plan lends itself to further PDSA cycles should the outcome not be achieved. Although the balancing measures, such as increasing the number of clinics that the consultants will be required to attend, thereby increasing their workload, exist, it is expected that this will not compromise the overall aim of improving the timeliness of care for patients with thyroid dysfunction.

6.0 References

Agency for Healthcare Research and Quality (2017). The Six Domains of Health Care Quality. https://www.ahrq.gov/professionals/quality-patient-safety/talkingquality/create/sixdomains.html#_ftn1. Content last reviewed 27th May 2017.

Agency for Healthcare Research and Quality. <https://www.ahrq.gov/professionals/quality-patient-safety/quality-resources/tools/chtolbx/understand/index.html>. Content last reviewed on June 10, 2017.

Alexander EK, Pearce EN, Brent GA, Brown RS, Chen H, Dosiou C, Grobman WA, Laurberg P, Lasarus JH, Mandel SJ, Peeters RP, Sullivan S (2017). 2017 Guidelines of the American Thyroid Association for the diagnosis and management of thyroid disease during pregnancy and the postpartum. *Thyroid*. 27(3):315-389.

Baker GR, Norton PG, Flintoft V, Blais R, Brown A, Cox J, Etchells E, Ghali WA, Hebert P, Majumdar SR, O'Beirne M, Palacios-Derflingher L, Reid RJ, Sheps S, Tamblyn R (2004). The Canadian Adverse Event Study: the incidence of adverse events among hospital patients in Canada. *Canadian Medical Association Journal*. 170(11):1678-1686.

Baker and Norton (2004). Adverse events and patient safety in Canadian Healthcare. *Canadian Medical Association Journal*. 170(3):353-4.

Basudev N, Crosby-Nwaobi R, Thomas S, Chamley M, Murells T, Forbes A (2016). A prospective randomised controlled study of a virtual clinic integrating primary and specialist care for patients with type 2 diabetes mellitus. *Diabetic Medicine*. 33(6):768-776.

Bellringer SF, Brogan K, Cassidy L, Gibbs J (2017). Standardised virtual fracture clinic management of radiographically stable Weber B ankle fractures is cost-effective and reproducible. *Injury*. 48(7):1670-1673.

Boran G, Moran N, McGowan A, Sherlock M, Gibney J (2016). A quick reference guide for use of thyroid function tests in primary care. <https://www.icgp.ie/go/library/catalogue/item/E22FA8CE-0824-A447-32C36709EEBAA916>. Content last reviewed on September 28th, 2017.

Brennan TA, Leape LL, Laird NM, Hebert L, Localio LR, Lawthers AG, Newhouse JP, Weiler PC, Hiatt HH (1991). Incidence of adverse events and negligence in hospitalized patients: results of the Harvard Medical Practice Study. *New England Journal of Medicine*. 324(6):370-6.

Burman KD, Wartofsky L (2015). Thyroid nodules. *New England Journal of Medicine*. 373(13):2347-2356.

Chami N, Simons JE, Sweetman A, Don-Wauchope AC (2017). Rates of inappropriate laboratory test utilization in Ontario. *Clinical Biochemistry*. 50(15):822-827.

Cooper DS (1985). Propylthiouracil levels in hyperthyroid patients unresponsive to large doses. Evidence of poor patient compliance. *Annals of Internal Medicine*. 102(3): 328-331.

Costello AG, Nugent BD, Conover N, Moore A, Dempsey K, Tersak JM (2017). Shared care of childhood cancer survivors:a telemedicine feasibility study. *Journal of Adolescent and Young Adult Oncology*. un 28. doi: 10.1089/jayao.2017.0013. [Epub ahead of print].

Cramon P, Winther KH, Watt T, Bonnema SJ, Bjorner JB, Ekholm O, Groenwold M, Hegedus L, Feldt-Rasmussen U, Rasmussen AK. (2016). Quality of life impairments persist six months after treatment of Graves' hyperthyroidism and toxic nodule goiter: a prospective cohort study. *Thyroid*. 26(8):1010-1018.

Davenport C, Alderson J, Yu IG, Magner AC, O'Brien DM, Ni Ghiollagain M, Kileen S, Heneghan M, McDermott JH, Sreenan S, Hickey N, Kyaw-Tun T (2017). A Review of Indications for Thyroid Ultrasound Scanning in Connolly Hospital (poster presentation at the Irish Endocrine Society, October 2017), *Irish Journal of Medical Science*. 186 (supp 9): S360.

Diabetes Ireland (2017). Prevalence of Diabetes. <https://www.diabetes.ie/about-us/diabetes-in-ireland/>. Content last reviewed on October 16 2017.

European Commission (2003).
<http://ec.europa.eu/social/main.jsp?catId=706&langId=en&intPageId=205>. Content
last reviewed on September 28th, 2017.

Health Service Executive, (2016). Framework for improving quality in our Health
Service.
[http://www.hse.ie/eng/about/Who/qualityandpatientsafety/qpsfocuson/Framework-
for-Improving-Quality-2016.pdf](http://www.hse.ie/eng/about/Who/qualityandpatientsafety/qpsfocuson/Framework-for-Improving-Quality-2016.pdf). Content last reviewed 27th May 2017.

Garber JR, Cobin RH, Gharib H, Hennessey JV, Klein I, Mechanick JI, Pessah-
Pollack R, Singer PA, Woeber KA (2012). Clinical practice guidelines for
hypothyroidism in adults: cosponsored by the American Association of Clinical
Endocrinologists and the American Thyroid Association. *Thyroid*. 22(12) 1200-1235.

Giorda CB, Carna P, Romeo F, Costa G, Tartaglino B, Gnani R (2017). Prevalence,
incidence and associated co-morbidities of treated hypothyroidism: an update from a
European population. *European Journal of Endocrinology*. 176(5):533-542.

Goldfien R, Pressman A, Jacobson A, Ng M, Avine A (2016). A pharmacist staffed,
virtual gout management clinic for achieving target serum uric acid levels: a
randomised clinical trial. *Permanente Journal*. 20(3):18-23.

Houses of the Oireachtas Committee on the Future of Healthcare Sláintecare Report
May 2017.

HSE (2016). Health Service Performance Report. November 2016.
<http://www.hse.ie/eng/services/publications/performance-reports/novsuppreport.pdf>.

Content last reviewed on Oct 6th, 2017.

Institute of Medicine. (2005). Crossing the quality Chiasm: A New Health System for the 21st Century. Washington, DC: National Academic Press.
https://www.ncbi.nlm.nih.gov/books/NBK222274/pdf/Bookshelf_NBK222274.pdf.

Institute for healthcare improvement:
<http://www.ihi.org/resources/Pages/Tools/Quality-Improvement-Essentials-Toolkit.aspx>. Content last reviewed on Sept 21st, 2017.

Institute for Healthcare Improvement.
<http://www.ihio.org/education/IHIOpenSchool/resources/Pages/Activities/DefiningQualityAimingforaBetterHealthCareSystem.aspx>.

International Diabetes Federation (2017). <http://www.diabetesatlas.org>. Content last reviewed on September 28, 2017.

Irish Cancer Society. <https://www.cancer.ie/about-us/news/colonoscopy-waiting-times>. Content last reviewed on June 1st, 2017.

Jayaram PR, Bhattacharyya R, Jenkins PJ, Anthony I, Rymaszewski L (2014). A new "virtual" patient pathway for the management of radial head and neck fractures. *Journal of Shoulder & Elbow Surgery*. 23(3):297-301.

Koulouri O, Moran C, Halsall D, Chatterjee K, Gurnell M (2013). Pitfalls in the measurement and interpretation of thyroid function tests. *Best Practice & Research. Clinical Endocrinology & Metabolism*. 27(6):745-762.

Kuwaiti AA, Subbarayalu AV (2017). Reducing patients' falls rate in an Academic Medical Center (AMC) using Six Sigma "DMAIC" approach. *International Journal of Health Care Quality Assurance*. 30(4): 373-384.

Lin DC, Straseski JA, Schmidt RL, Various TTBG (2017). Multi-center benchmark study reveals significant variation in thyroid testing in United States. *Thyroid*. Jul 5. doi: 10.1089/thy.2017.0190. [Epub ahead of print].

Mark DA, Fitzmaurice GJ, Haughey KA, O'Donnell ME, Harty JC (2011). Assessment of the quality of care and financial impact of a virtual renal clinic compared with the traditional outpatient service model. *International Journal of Clinical Practice*. 65(10):1100-1107.

McKirdy A, Imbuldeniya AM (2017). The clinical and cost-effectiveness of a virtual fracture clinic service: an interrupted time series analysis and before-and-after comparison. *Bone and Joint Research*. 6(5):259-269.

National Institute of Clinical Excellence (2015). Guidelines for recognition and referral of cancers. <https://www.nice.org.uk/guidance/ng12/chapter/1-Recommendations-organised-by-site-of-cancer#lower-gastrointestinal-tract-cancers>.

Content last reviewed on June 1st, 2017.

Peeters RP (2017). Subclinical Hypothyroidism. *New England Journal of Medicine*. 376(26):2556-2565.

Rafter N, Hickey A, Conroy R, Condell S, O'Connor P, Vaughan D, Walsh G, Williams DJ (2017). The Irish National Adverse Events Study (INAES): the frequency and nature of adverse events in Irish hospitals – a retrospective record review study. *British Medical Journal Quality and Safety*. 26(2) 111-119.

Rafter N, Hickey A, Condell S, Conroy R, O'Connor P, Vaughan D, Williams D (2015). Adverse events in healthcare: learning from mistakes. *Quarterly Journal of Medicine*. 108(4):273-277.

Reason (2000). Human errors: models and management. *British Medical Journal*. 320(7237):768-70.

Ross DS, Burch HB, Cooper DS, Greenlee MC, Laurberg P, Maia AL, Rivkees SA, Samuels M, Sosa JA, Stan MN, Walter MA (2016). 2016 American Thyroid Association Guidelines for the diagnosis and management of hyperthyroidism and other causes of thyrotoxicosis. *Thyroid*. 26(10): 1343-1421.

Royal Berkshire NHS Trust. <http://www.royalberkshire.nhs.uk/patient-information-leaflets/Thyroid%20virtual%20clinic%20nurse%20led>. Content last reviewed on October 15th, 2017.

Royal College of Physicians (2017). Setting standards: referring wisely. <https://www.rcplondon.ac.uk/projects/outputs/referring-wisely>. Content last reviewed on October 17 2017.

Ryan EM, Rogers AC, Hanly AM, McCawley N, Deasy J, McNamara DA (2014). A virtual outpatient department provides a satisfactory patient experience following endoscopy. *International Journal of Colorectal Disease*. 29(3):359-364.

Wiersinga WM (2014). Adult Hypothyroidism. <http://www.thyroidmanager.org/chapter/adult-hypothyroidism/>. Content last reviewed on March 21 2017.

World Health Organisation (2006). Quality of care: a process for making strategic choices in health systems. Geneva: World Health Organisation. http://www.who.int/management/quality/assurance/QualityCare_B.Def.pdf. Content last reviewed on October 19, 2017.

Yousef N, Yousef F (2017). Using total quality management approach to improve patient safety by preventing medication error incidences. *BioMed Central Health Services Research*. 17 (1): 621.

7.0 Appendices

Appendix 1. Proforma for consultant-delivered thyroid clinic.

Attach patient addressograph here

GP Name and address

Diagnosis	Medication	Change to medication

Date									
FT4									
TSH									
FT3									

Comments

Appendix 2 Project Plan Gantt Chart

Project Plan		Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17
Item	Responsible										
Define											
Arrange meeting with sponsor	MB	Complete									
Submit signed sponsorship form	MB	Complete									
Perform literature review	MB/SS	Complete									
Project aim & objectives	MB	Complete									
Carry our Stakeholder Analysis	MB		Complete								
Create process maps	MB			Complete							
Measure											
Identify champions	MB			Complete							
Analyse data measuring wait times	MB/SS			Complete							
Run chart of appointment wait times	MB					Complete					
Analyse											
Activity analysis of fishbone diagram	MB/SS						Complete				
							Complete				
Improve											
Design QI intervention	MB							Complete			
Complete project report	MB/SS/PJ										Complete
Submit Dissertation	MB										Complete
Submit signed sponsorship form	MB										Complete
Key:											
		Complete									
		Planned									
		Behind Schedule									
Team members:											
Mislav Buljubasic (MB)											
Dr. Pauline Joyce (PJ)											
Sponsor:											
Prof Seamus Sreenan (SS)											