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'Reduce Resistance' An Antibiotic stewardship program to change prescribing practices in a Public Dental Service

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‘Reduce Resistance’

An Antibiotic stewardship program to change prescribing practices in a Public Dental Service

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Abstract

This program implemented an antibiotic stewardship program (ASP) to change prescribing practices in one Public Dental Service with the aim of reducing the number of unnecessary antibiotic prescriptions and ensuring that those antibiotics which are prescribed adhere to best practice guidelines. There is vast scientific evidence that antibiotic resistance is promoted through excessive use of antibiotics and that Dental Surgeons are contributing significantly to this issue due to their inappropriate prescribing practices.

The HSE Change Model was used as a framework for the planning and implementation of this multifaceted Antibiotic Stewardship Program (ASP), which involved the implementation of best practice guidelines, clinical audit, an education program, an antibiotic ledger, and individualised clinician feedback. The ASP was designed considering the cultural, contextual and behavioural factors which influence prescribing practices. Staff engagement and effective communication was identified as critical for addressing resistance and ensuring a cycle of continuous improvement.

The evaluation found a measureable reduction in the numbers of antibiotics prescribed over the nine months of the program. Audit results provided evidence of adherence to best practice for antibiotic choice but, despite guideline implementation, discrepancies in the dosage and justification for prescription were found.
Ongoing stewardship interventions are required to sustain progress and encourage further improvements. Recommendations have been made for further research into the factors which influence the prescribing practice of dental surgeons.
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Finally, my thanks and love to my husband John, who tirelessly proofread and edited this thesis and to my children Niamh and Cormac, who will be happy to have their mother returned to them!
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Chapter 1  Dissertation Overview

1.1 Introduction

It is well documented that antibiotic resistance is promoted through excessive use of antibiotics in human, animal and environmental settings (Aminov, 2010; Michael et al., 2014, W.H.O. 2014)

There are potential side effects for any patient who is prescribed antibiotics. However the impact of antibiotic resistance does not just apply to individuals but is a global threat to human health, resulting in increased morbidity, mortality, and healthcare costs (Bell et al 2014). The ever increasing emergence of multi-drug resistant bacteria may soon result in a situation where antibiotics will no longer be effective for the prevention or treatment of even common infections and diseases (UK Department of Health, 2011). The US Centre for Disease Control and Prevention Threat Report (CDC, 2013) asserted that the “human race is now in the post-antibiotic era” where infections will be harder or impossible to control and formerly treatable diseases will be potentially fatal (Aminov, 2010; Michael et al., 2014).

There is international agreement that it is the responsibility of all healthcare services to implement programs to prevent and control the emergence of
antimicrobial-resistant organisms (Society for Healthcare Epidemiology of America et al., 2012; W.H.O., 2015).

Recognising this responsibility, the author implemented an Antimicrobial Stewardship program within a public dental service.

This chapter will discuss the Rationale for the proposed change, considering the organisational context. The specific aim and SMART objectives will be detailed and the author’s role in the implementation of the project will be outlined.

1.2 Rationale

Back as far as 2001 A Strategy for the control of Antimicrobial Resistance in Ireland ‘SARI’ (National Disease Surveillance Centre, 2001) recommended that effective use of antimicrobials be promoted by implementing guidelines and systems of monitor and control. Many considered this a hospital clinical issue, but recent evidence indicates that antibiotic resistant strains are being detected in patients in the community (Bell et al 2104).

In their 2013 Threat Report, the CDC suggested that approximately one third of all medical out-patient antibiotic prescriptions are unnecessary. It is recognised that to decrease the pace at which these new resistant strains are developing, health care providers must not only reduce the use
of antibiotics, but must also ensure that those antibiotics which are required are prescribed in an effective appropriate manner (National Disease Surveillance Centre, 2001; UK Department of Health, 2013).

As a profession, Dental Surgeons may feel far removed from the issue of antibiotic resistance but in fact are at the coal face, as it is estimated that between 7% and 11% of all antibiotics for human are prescribed by dentists and the literature provides evidence of Dental Surgeons routinely overprescribing antibiotics (Dar-Odeh 2010).

Antimicrobial stewardship is one of HIQA’s National Standards for the Prevention and Control of Healthcare Associated Infections (HIQA, 2009) and was listed in the HSE National Service Plan as an area of emphasis for Public Dental Services (Health Service Executive, 2014). As we move towards licensing and commissioning within the health sector, governance and adherence to standards is becoming an increasing priority. Implementation of clinical governance arrangements is in keeping with the National Standards for Better Safer Healthcare (HIQA, 2012) and, as Dental services had been advised of an expected HIQA audit in 2015, there was a sense of urgency and focus for evidence of good practice.

Antimicrobial Stewardship involves a variety of approaches and interventions to promote optimum usage of antibiotics, antifungals and antiviral therapies by reducing their overall prescriptions and to ensure effective appropriate usage when required. The aim is achieve best health
outcomes for individual patients, whilst limiting unintended consequences for the individual and the population as a whole (Dellit et al., 2007).

Recognising that antimicrobial resistance is a broad issue involving bacteria, viruses, fungi and parasites, the scope of this program was however limited to addressing the rapid development of bacterial resistance. It therefore focused on antibiotic prescribing, as this had been has been identified as an issue of concern within the dental profession (Sivaraman et al., 2013).

1.3 Organisational context

The author’s organisation is an ISA Public Dental Service which spans 2 rural counties, encompassing 27 surgeries in 15 locations. The organisation’s mission is to promote and contribute to the dental health and overall health and wellbeing of their targeted population which includes children, people with special needs and the elderly. In keeping with the Standards for Safer Better Health Care (HIQA, 2012) the service strives to improve quality and safety, ensuring that clinical decisions adhere to best practice guidelines.

The author is the Acting Principal Dental Surgeon in the ISA and in accordance with Section 35 of the Health Act (Irish Gov, 2004/2007), has clinical governance responsibility and accountability for both the quality of care and health outcomes for patients within her service. There was a
wealth of scientific evidence to support the implementation of Antibiotic Stewardship (Michael et al., 2014a; Prior et al., 2014) and, from a governance perspective, there were compelling internal and external drivers. A base line measure of the percentage of antibiotics being prescribed for emergency patients in the ISA over a two month period (April- May 2014) indicated variation between the sampled dentists' prescription numbers. As there was no indication of any case mix difference, this lack of consistency amongst the dentists in the ISA highlighted a potential clinical risk.

![Graph representing the % of Emergency Patients who received antibiotics by Clinician Preintervention](image)

**Figure 1**  Graph representing the % of Emergency Patients receiving antibiotics per dentists A- O

This graphically displays the variance in the prescription rates. Dentist ‘L’ prescribed antibiotics for 48% of their emergency patients, whilst dentists ‘C’ and ‘I’ prescribed antibiotics to only 7%. Following discussions with the dentists, it became apparent to the author that some were opting to give
antibiotics on occasions when a tooth extraction would be the best evidence-based treatment option.

The HSE were due to publish the Irish Dental Prescribing Best Practice Guidelines in 2014, so the stewardship program proposed to introduce these guidelines as one initiative of the stewardship program.

New Primary Care KPIs had been introduced to dental services during 2014. Adherence to targets for one such KPI, aiming to track timely, post antibiotic treatment, surfaced as a risk in the ISA. Results: as low as 45% had been recorded, which is significantly below the 95% target. Although this program of stewardship proposed to primarily track incidence of antibiotic prescribing and to monitor adherence to dosage guidelines, it also incorporated the monitoring of adherence to KPI targets as part of overall quality assurance.

It was evident that there was a powerful rationale for the implementation. To further investigate the dynamic interactions of the various driving and restraining energies a force field analysis was conducted (appendix 1). Findings from the analysis relating to the internal and external environment will be further discussed in Chapter three.

1.4 Project Description

The project took a multi-faceted approach. One initiative was an education program which informed the dentists of the findings relating to their prescribing practices, updated them on the literature regarding antibiotic
resistance and finally introduced the new guidelines. The implementation of an antibiotic ledger recording antibiotic type/dose/duration and justification, for each prescription allowed for the introduction of a clinical audit system. The audit assessed adherence to best practice as laid out in the guidelines. To complement the audit there was ongoing monitoring of KPI targets and the numbers of patients receiving antibiotics, which monitored changes in prescribing practices and compliance to KPI requirements.

1.4.1 Aim

The aim of the project was to reduce the number of antibiotics prescribed within the Public Dental Service in one ISA and to ensure that those antibiotics that are prescribed are in line with best practice guidelines.

1.4.2 Objectives

1. All staff to have attended an education program (by Dec 2014).

2. To design and implement an antibiotic ledger (by Dec 2014)

3. To Implement a clinic audit to review (by March 2015)
   • Use of antibiotic ledger for all prescriptions
   • Adherence to antibiotic guidelines for prescription in cases of dental infection

4. To reduce the number of antibiotics prescribed by clinicians (by March 2015)
5. To achieve the 95% target for the KPI relevant to antibiotic prescribing by Feb 2015

1.4.3 Potential outputs and outcomes

1. Improved patient care
2. Reduction in unnecessary, inappropriate prescriptions.
3. Fewer visits required to complete treatment.
4. Patients relieved of pain in a more timely fashion.
5. Evidence based treatment of infection, reducing risk of severe infection and, in turn, reducing potential hospital admissions and General Anaesthetics.
6. Contribution of Dental Services to the struggle against antibiotic resistance for the individual and society.
7. Decreased costs for the individual and the state (if medical card holder) as fewer antibiotics prescribed.
8. Potential for improved patient flow and increased capacity, due to the fewer appointments required to treat individual cases.
1.5 Author’s role in project implementation

As already discussed the author, as Acting Principal Dental Surgeon, is clinically accountable for the quality of patient care provided and was therefore in an ideal position to roll out the project:

She holds a position of authority and as such has the legitimate power (French and Raven, 1959) to provide the dentists with feedback from the audits and to address any lack of compliance with guidelines or KPIs. There was no culture of clinical audit within dental services and perceived interference with clinical autonomy was identified as a potential source of resistance. As a clinical manager who has her own case load and 20 years of clinical experience she had the advantage of expert personal power which assisted with the acceptance of the audit system. A Stakeholder Analysis (Appendix 4) was completed to assess the likely sources of support and resistance. This assisted with the establishment of early coalitions (Lewin, 1947) and in identifying and countering resistance from the outset (Buchanan and Boddy, 1992).

Her leadership style, the power tactics that she employed and her cultural sensitivity were critical to the successful implementation of this change project. From a practical perspective, the author is involved in the organisation of the Continuing Professional Development program, so could ensure that the guidelines were introduced appropriately and that all other necessary education was provided.
She has access to all clinical statistics and carried out the auditing and data analysis with assistance of one of her Senior Dental Surgeons. The PDS has the responsibility to review and report on the KPIs and to ensure that targets are met, so the monitoring of this was within the remit of the role.

Finally the author has been invited to sit on the steering group for the implementation of the Guidelines nationally which will provide an opportunity to disseminate findings from this program to the national forum.

1.6 Thesis outline

The thesis provides a comprehensive description of the project

Chapter 2

Chapter two is a systematic review of the literature relating to antibiotic resistance, antibiotic prescribing in dentistry and stewardship programs. This provided insight into current thinking and evidence in the area which informed the project design.

Chapter 3

Chapter three outlines the implementation process following careful analysis of the existing situation. It further details the methodology used to put the change into practice under the framework of the HSE change model.
Chapter 4

Chapter five explores the significance of evaluation within healthcare and provides the reader with a detailed description of the project evaluation, which assessed if objectives were successfully achieved.

Chapter 5

The final chapter summarises the project findings and explores the learning and experience of the author as the change agent. It includes a discussion of the successes and limitations of the project, analysing the output and outcomes and their impact locally. Future recommendations and the potential dissemination were also considered.

1.7 Summary

Antibiotic resistance is recognised as an issue of major concern globally. Dentists have a moral and professional obligation to accept they are contributing to the problem and to act responsibly by ensuring they adhere to best practice guidelines.

This change project addresses the issue by implementing an Antibiotic Stewardship program in one Public Dental Service with the hope of future dissemination to other ISAs.
Chapter 2   Literature Review

2.1 Introduction

This literature review explores Antibiotic Stewardship, examining the causes and effects of antibiotic resistance, the role of the Dental Surgeon in this global issue and the effectiveness of differing Antibiotic Stewardship Programs which aim to bring this threat under control.

2.2 Search Strategy

The Search strategy involved the review and analysis of approximately 40 studies and white papers which were primarily published from 2010 and 2015. The search was carried out using a number of data bases including the Cochrane Database of Systematic Reviews, LENSUS, MEDLINE, EMBASE and Google Scholar. Additional studies were obtained from the bibliographies of retrieved articles.

Key words used: Antibiotic resistance, Dental, Stewardship programs, Effective.
2.3 Review of Themes

2.3.1 Antibiotic resistance

Alexander Fleming’s accidental discovery of a mould called ‘Penicillium Notatum’ in 1928, which he found had an inhibiting effect on certain bacteria, was the dawn of a new Age of medicine, when antibiotics enabled the treatment of previously serious Infectious diseases (Fleming, 1929).

For nearly 70 years the world has relied on antibiotics to protect both human and animal health. This reliance is now seriously at risk due to the emergence of antibiotic resistant (AR) bacterial infections, resistant to first line antibiotics to which they would have been previously susceptible (Aminov, 2010; Johnson and Hawkes, 2014; Michael et al., 2014).

We are at now at the beginning of a ‘post antibiotic era’, where infections will be harder or impossible to control and formerly treatable diseases will be potentially fatal (Aminov, 2010; Michael et al., 2014). There is consensus in the literature that AR is becoming a worldwide threat (Aminov, 2010; Johnson and Hawkes, 2014; Michael et al., 2014). In 2014, the World Health Organization described the “crisis as dire” and highlighted the risk of Methicillin Resistant Staphylococcus Aureus (MRSA), which is just one organism, but is the cause of more deaths in the USA annually than the combined figures for death attributed to emphysema, HIV/AIDS, Parkinson’s disease and homicide (CDC, 2013).
The Baltic States have been found to have serious problems with ‘extensively drug-resistant tuberculosis’ (Abubakar et al., 2012). Gonorrhoea has also emerged as another disease which had been very treatable with antibiotics, but for which recent years have seen the loss of traditional treatment options, with very few potential alternatives (Chisholm et al., 2010). The UK Department of Health has noted a worrying increase in resistance in Gram-negative bacteria, for example, *Escherichia coli* (*E. Coli*) which is a specific public health issue, due to the limited treatment choices for such infections (UK Department of Health, 2011). In Europe 25,000 patients die annually from infectious diseases caused by a multidrug resistant bacteria. The EU healthcare costs associated with resistant bacterial infections have risen to 1.5 billion annually (European Medicines Agency and European centre for disease prevention and control, 2009).

The concept of AR is not a new one; it was raised by Alexander Fleming himself in 1945 during his famous Nobel lecture. AR is a natural phenomenon of genetic mutation in response to adaptive challenges. From a Darwinian perspective, the bacteria are adapting to ensure their survival and the capacity for transfer of genetic information between species. Some species are more susceptible to select for resistance, which increases the overall incidence of resistant organisms (Aminov, 2010; Lipsitch and Levin, 1997). Humans have dramatically interfered with this process with widespread usage of antibiotics worldwide, which has created
a massive pressure on the bacterial population, resulting in the extraordinary levels of AR in the modern world (Davies and Davies, 2010; Kuehn BM, 2013).

Bell et al’s (2014) systematic review of 240 studies examining the association between community based AR and the utilization of antibiotics, showed overwhelming evidence that increase usage of antibiotics increased resistance for the individual and the population. The large number of studies considered in the analysis is one of the major strengths of the review. An additional strength was the examination of AR from a community rather than a hospital perspective. This was a change from previous reviews and it verified that AR is not just a hospital issue. The review also highlighted that levels of AR were higher in Southern Europe, where antibiotic consumption rates are higher than that of the Northern countries. Whilst this information is very valuable for the targeting of Antibiotic Stewardship programs in these regions, the review could be criticised for being narrow in focus, as there was no exploration of potential other contributory factors which might have influenced the level of resistance.

The WHO (2014) describes AR as a ‘multifactorial problem’. Recent publications concur that AR is a complex matter, driven by a range of interconnected factors, such as poor quality medicines, poor infection
control, inadequate vaccination programs, insufficient research into new generation antibiotics, in addition to antibiotic misuse (Johnson and Hawkes, 2014; Michael et al., 2014; WHO, 2014). The Indian subcontinent, for example, is recognised as a ‘hot bed’ for AR. The inappropriate use of high generation antibiotics, non-compliance with prescription courses, over the counter sale of antibiotics, weak sanitation and poor hospital infection control, along with poor prescribing practices, have all been associated with AR in this region (Cabello et al., 2013; Kounteya, 2011; Michael et al., 2014). It is evident that AR is a far more extensive issue than just that of stewardship for these countries.

Animal Involvement

There is evidence AR may transfer to humans from animals, either from direct contact, or food consumption (Cabello et al., 2013; Michael et al., 2014a). This is a point of contention with some veterinary opinion which suggests that antibiotic use in animals has improved human health, as the lower disease levels in animals has reduced infections to humans from the food chain. Although they do recognise and accept that AR consequential to agricultural use of antibiotics could affect the human population, they claim that the impact is negligible in comparison to that attributed to human usage (Oliver et al., 2011).
The CDC contends that, whilst animal consumption does contribute to the overall worldwide level of AR, the primary cause is human overuse (National Disease Surveillance Centre, 2001; S.A.R.I. Hospital Antimicrobial Stewardship Working Group, 2009; UK Department of Health, 2013).

The SARI Guidelines (2009) and UK Five year antimicrobial Resistance Strategy (2013) reflect this, focusing on improving knowledge, stewarding existing treatments and encouraging the development of new antibiotics for human usage (Centre for Disease Control and Prevention, 2013; S.A.R.I. Hospital Antimicrobial Stewardship Working Group, 2009; UK Department of Health, 2013a). Interestingly, at the same time, the UK Code of Professional Conduct for Veterinary Surgeons (2011) and a recent Irish policy document relating to prescribing of antibiotics for vets (Royal College of Veterinary Surgeons, 2011; Veterinary Ireland, 2014) have also advised the prudent use of antimicrobials.

Recognising that the issues which contribute to AR are complex and varied, the focus of this paper will however be the practitioners’ role and the prescribing patterns, in particular, of Dental Surgeons within the parameters of the change project.
2.3.2 The Role of the dental surgeon

Orofacial infections are primarily of dental origin. Therefore it is not surprising that antibiotics are the most common medication prescribed by Dental Surgeons (Lewis, 2008). The literature highlights that dentists prescribe significant percentage of global antibiotics (Haas et al., 1998) and therefore have the potential to significantly impact AR (Michael et al., 2014). The rapidly increasing rates of AR could be impeded if dentists and all prescribing health care professionals took their responsibility for antibiotic preservation more seriously.

As prescribers, dentists have an obligation to adhere to the principles of prudent antimicrobial prescribing (SARI Hospital Antimicrobial Stewardship Working Group, 2009) and to understand and follow the current evidence based guidelines. An antibiotic should only be prescribed when there is likely to be a clear clinical benefit (Health protection surveillance centre, 2011) and dentists must ensure that prescriptions are appropriate, optimized, justified and documented (Scottish Dental Clinical Effectiveness Programme, 2011).
Substandard practices

Literature investigating knowledge levels and prescribing practices, for antibiotics, of dental surgeons worldwide, has provided comprehensive evidence of substandard prescribing practices (Bennadi, 2013; Dar-Odeh et al., 2010a; Tanwir et al., 2013).

It is worth noting that antibiotics are an invaluable adjunct to the treatment of serious dental infection and therefore are completely necessary in certain clinical circumstances. However, most dental pain originates from inflammatory conditions, which require local interventions, as opposed to antibiotic therapy (Fedorowicz et al., 2013). Acute periapical infection, dry socket and localised swelling are examples of clinical cases which do not indicate antibiotics (Sharif et al., 2014 and Siqueira and Rôças, 2013). Dar-Odeh et al in 2010 reviewed literature which suggested that almost half of the dentists in England, Turkey and Kuwait would prescribe antibiotics for dry sockets; also finding that antibiotics were prescribed in England, Norway Kuwait and Australia, in cases of local swelling, where guidelines would indicate local drainage. Worryingly they found that dentists were routinely prescribing antibiotics for pulpitis and finally there was alarming evidence that dentists were prescribing antibiotics for viral infections such as herpes. On a positive note they found that most dentists would not prescribe at the request of the patient, with the exception of those in Eastern Europe who reported prescribing based on patients’ expectations, especially when short for time (Dar-Odeh et al., 2010).
The Scottish guidelines recommend Amoxicillin, Pen V, Metronidazole and Erythromycin (narrow spectrum antibiotics) for most dental patients. Second-line antibiotics for dental infections may be necessary if a patient has not responded to the first-line antibiotic prescribed. The guidelines advocate patient referral or a specialist consult before prescribing clindamycin, co-amoxiclav or clarithromycin (broad spectrum) which can dramatically increase the risk of AR (Scottish Dental Clinical Effectiveness Programme, 2011). Dar-Odeh et al(2010) indicated evidence of good practice in common prescriptions, which were primarily narrow spectrum antibiotics such as Pen V, amoxicillin and metronidazole, but they noted that clavulanate (Broad spectrum) is also routinely used, which would be an issue for concern.

While the findings of this review are of interest, there may be limitations to its validity, in that it examined a relatively small number of studies and, although the review itself is reasonably recent (2010), the literature included in the review is mostly pre 2005, so may not represent the current situation. A more recent Indian review is unfortunately of no addition to the discussion as it examined more or less the same studies adding very little to the argument (Bennadi, 2014)

An Iranian study completed in 2013 evaluated the prescribing practices of 219 dentists and found inappropriate justification, and wide variation in
dosage, frequency and duration. They called for Guidelines to be launched in Iran to deal with this problem (Vessal et al., 2011). However in India, where they have published up to date Guidelines, a large study sampling 1600 dentists, which did show evidence of compliance in the area of the most commonly prescribed drugs, unfortunately once again provided evidence of widespread inappropriate over-prescription and lack of uniformity in dental prescribing practices. Their recommendations were focused on education and adherence to the guidelines (Garg et al., 2014). A study from Pakistan would concur that education is required as, when 100 full time employed dentists in three dental colleges in Pakistan were asked to fill in a questionnaire, to assess their ability to relate knowledge to practice, regarding managing common dental infections, nearly sixty percent had a suboptimal score (Tanwir et al., 2013). Kohler at al proposed that Guidelines are often not be specific enough, having found that dentists in Switzerland were uncertain regarding the correct clinical indications for when to prescribe (Köhler et al., 2013). It is worrying to note that in one area where the recommendations are extremely specific, relating to the avoidance of the potential complication of Infective endocarditis, for patients with particular heart conditions, undergoing specific dental treatments, there is still poor guideline compliance and variation in interpretation (Tong et al., 2014).
What will it require to persuade dentists to follow best practice? The Scottish Dental Prescription Guidance was issued in 2008 and updated in 2011 (Scottish Dental Clinical Effectiveness Programme, 2011) and data from a very recent study of Scottish dentists in hospital and clinical environments shows disparity in prescribing persists and that the total consumption of antibiotics is increasing (Prior et al., 2014). The Scottish have commenced a 12 month trial (RAPID) to compare the success rates of audit with and without individualised feedback (Prior et al., 2014), hoping that this may provide some valuable insight into this complex issue.

The final theme of this literature review examines the current available evidence regarding effective stewardship.

2.3.3 Antibiotic Stewardship Programs (ASPs)

At its simplest, Antibiotic Stewardship is the prudent use of antibiotics (Manjunath et al., 2013). An ASP is a collection of interventions promoting this prudence. This may involve initiatives such as the introduction of evidence based standards (Guidelines), staff education, consumption surveillance and the audit of outputs and outcomes. The aim is to optimise health benefits for patients whilst minimising potential unintended consequences (Ashiru-Oredope et al., 2012). ASPs are supported by schemes such as the European Antibiotic Awareness Day (EAAD, 2008), which commenced as an initiative from European Centre for Disease
Control (ECDC), aiming to increase both public and professional awareness of the growing AR problem and to promote responsibility throughout society, to preserve antibiotics for future generations.

As previously stated, Antibiotic Stewardship is standard 12 of the National Infection Prevention Control Guidelines (HIQA, 2009), which requires evidence of judicious prescribing and stewardship programs (Guidelines for Antimicrobial Stewardship in Hospitals in Ireland, SARI Hospital Antimicrobial Stewardship Working Group, 2009). Despite being primarily orientated towards hospital care, the Guidelines advise that all health sectors should strive to implement their recommendations. They acknowledge from the outset that many health care services will be unable to implement the Guidelines to their fullest extent due to resource restrictions.

The Guidelines endorse the following AS initiatives

- Ongoing education
- Distribution of antimicrobial prescribing guidelines to all prescribers where possible, in electronic format
- Electronic patient records
- Electronic prescribing/computer-based surveillance
- Annual audits of antimicrobial prescribing to include the proportion of antimicrobial which use is in accordance with guidelines
• Regular direct feedback of audit results to prescribers and clinical directors
• Introduction of point prevalence surveys to monitor antibiotic consumption
• Feedback to all staff and management results of Point Prevalence Surveys

Monitoring antibiotic consumption data

As outlined in the SARI recommendations, the monitoring of antibiotic consumption trends is considered an important element of National AS. Data from an Irish Hospital based Point Prevalence Survey in 2012 provided static information, but unfortunately could not indicate trends due to methodology inconsistencies between Irish Point Prevalence Studies (Burns et al 2012). However it did indicate that Ireland’s overall prescription figures were comparable with Britain (34%). Unfortunately, it also recorded that we had significantly higher rates of broad spectrum antibiotics usage, which indicates poor guideline compliance. This is an issue which requires further research and corrective action. The author could not find any published data regarding Primary Care prescribing in Ireland. If the assumption that our Primary Care rates and trends are broadly similar to the UK is accepted, then it is worth examining their figures. Overall antibiotic prescriptions decreased in the UK between 1995 and 2000, but have increased steadily from 2000 to 2011. Prescription rates in the primary care setting have increased by 30% over this period (NHS
Business Service Authority, 2011). This increase is of great concern, particularly in an environment such as the UK which has had a National Strategy to control antimicrobial resistance for many years (UK Dept. of Health, 2000) and where the issue taken so seriously that implementation of ASPs within Health care organisations, was made a legal requirement (UK Government, 2005). If official policy and legal requirements are insufficient to effect change, what kind of ASPs could be implemented at the coal face to make a difference?

2.3.4 Effective programs

Back as far as 1996 it was recognised that publishing research has little direct impact on clinical practice and that even the introduction of Guidelines could only succeed when they actively engage prescribers in their clinical decisions (Eve and Goldon, 1996).

More recent research agrees that the implementation of Guidelines alone is ineffective (Niwa et al., 2012; Prior et al., 2014). However Lübbert et al (2014) found positive change in the prescription of cephalosporines and fluoroquinolones (broad spectrum antibiotics) in one German university hospital following the introductions of evidence based guidelines. Why would this trial have succeeded where others failed? Might there have been a local issue within the hospital or cultural issue that predisposed German doctors to good practice or perhaps it is a limitation of the study
that it failed to examine additional interventions which might have complemented the effect of the guidelines. Unfortunately the study did not analyse the reasons for their success in any depth, as this could have provided valuable insight (Lübbert et al., 2014).

Lemaire et al (2014) observed that, when Guidelines were introduced in one French hospital, no significant changes in prescribing practices were recorded. But when pre-prescription guidance from an infectious disease specialist was provided, there were noteworthy improvements in Guideline compliance (Lemaire et al., 2014). This concurs with evidence from a US teaching hospital, where an intervention involving antimicrobial related recommendations from a senior clinician and a clinical pharmacist resulted in an uptake of 85% of recommendations, significantly improving prescription practices. This resulted in lower in-hospital stay time and direct cost savings per patient (Cope and Chestnutt, 2014). SARI recommended the incorporation of pharmacist support into hospital prescribing (SARI Hospital Antimicrobial Stewardship Working Group, 2009). However, the author could not find any indication in the literature, that the introduction of specialist guidance into a primary care setting, such as dental services might be successful and there would be many practical challenges to this type of approach.

A Japanese study similarly established that Guideline introduction combined with an education program and a consultation with a senior physician proved very effective but also found that the positive result was
undone once the intervention ceased, emphasising the importance of continuous interventions, similar in nature to the PDSA cycle, to sustain improvements (Niwa et al., 2012).

Education

Education is recognised as an integral part of any ASP and is usually a popular initiative with clinicians, when compared to alternatives such as restrictive practices. However education alone, without the addition of more active interventions, has been shown to have little impact (Cisneros et al., 2014). Individualised education sessions have proven to be a practical, effective ASP (Solomon et al., 2001). Very successful results were recorded following a trial involving one-to-one prescribing education sessions, where the primary care paediatricians received the training in their own clinics (Gerber et al., 2013).

However this type of intervention would be very labour intensive and, considering staff shortages, would be an unlikely option in most current HSE settings.

Audit

Research indicates that audit is a successful method of AS when part of a broader ASP (Arnold and Straus, 2005; Palmer et al., 2001; Solomon et al., 2001). This type of intervention has proved particularly effective when
combined with personalized feedback (Elligsen et al., 2012). Regrettably this type of intervention would have resource implications comparable to that of one-to-one education, and therefore maybe unrealistic considering the current financial restrictions within the HSE. Martens et al (2007) reported successful results from a program of audit and feedback for GP trainees, which specifically tailored education and one to one feedback to those trainees who most needed to change their behaviour. These results might provide optimism and a more realistic model from a financial perspective.

2.4 Implications for the Project

The literature review has demonstrated poor prescribing practices within dentistry, which are potentially contributing significantly to the complex problem of worldwide antibiotic resistance. This validates the rationale for the ASP implementation.

It has also provided strong evidence regarding the limited effectiveness of Guideline introduction and Education programs, without the support of initiatives such as audit or individualised education and feedback. This underlined how challenging it can be to change clinical practice and highlighted the importance of designing an evidence based stewardship program which would engage clinicians.
2.5 Summary

The literature emphasised how the continual spread of antimicrobial resistance worldwide puts the health of populations at risk. It exposed the requirement for health organisations to implement evidenced based Antimicrobial stewardship programs to ensure that dentists and other health care professionals are adhering to prudent antibiotic prescribing practices. The findings regarding the effectiveness of the differing ASP types informed this change program and assisted with the selection of sustainable initiatives.
Chapter 3  Methods

3.1 Introduction

This chapter outlines the methods used to influence the prescribing behaviours of the Dental Surgeons involved in the program. The choice of initiatives was informed by the evidence, from the literature review, regarding the methods employed in effective ASPs. The author explored the potential for culture, resistance and leadership style to impact the success of the ASP. The driving forces which supported the need for a reduction in antibiotics prescription were considered against probable restraining forces, providing an analysis which assisted in planning and implementing the program. The author discusses the importance of change management within health services and examines various approaches to change, including the change model employed to guide this process.

3.2 Approaches to Organisational Development

It is widely accepted that health services are one of the most complex systems in modern society (Glouberman and Mintzberg, 2001; Marchal et al., 2009). To develop and progress, it is essential that Health Services continually evolve to ensure optimum outcomes for all stakeholders (DOH future health). If these changes are not managed they will fail (Kotter,
1995; Smith, 2011). The author recognised that it would be a challenge to successfully manage this change and that she must adopt an evidence-based approach to her program implementation, to ensure the best outcome.

Not all change is successful; it is of concern that Balogun and Hailey (2008) have recorded failure rates of up to 70% for change projects. They suggest that the wide variety of opposing theories and approaches may cause confusion and conclude that poor structure and inadequate planning also contribute to the low success rates. This complements the view of Munn-Giddings and Winter (2013) who argue that strategic thinking and planning are essential for successful change within healthcare. Others theorise that initiatives fail due to ineffective leadership (Gill, 2011). Perhaps leaders are ineffective as a result of the aforementioned confusion of approaches, unsure of the best change methods to employ. Burnes (2004) claims, that managers require the guidance of an unambiguous, practical change theory to effectively manage change. However both Shanley (2007) and Burnes (2004) agree that no one approach will suit all circumstance and suggest that management should understand the strengths and limitations of various approaches and be prepared to adapt models, utilising the most suitable elements for any given situation.

The literature concurs that planning and structure is fundamental to effect change and that the use of a defined model improves the probability of the success (Leeman et al., 2007; McAuliffe and Van Vaerenbergh, 2006;
Shanley, 2007). However, whilst ‘strategic-planning models’ are considered important, good leadership is also essential to successful staff engagement which is at the heart of any change (Robinson and Hayday 2007).

Acknowledging the contribution of effective change management processes and the significance of the leadership role in the successful introduction of change (Gill, 2011) the author studied a number of different change models and explored her own leadership style and preferences.

### 3.3 Rationale for OD Model Selected

The author considered the HSE Model to be the most appropriate model for this change process for a number of reasons as outlined below.

Unlike the classic linear change models as described by Lewin, (1951) and Kotter (1996) which are unsuitable for use in unstable organisations, such as the rapidly adapting health services (Burnes, 2004) the HSE model has adopted a more modern approach. It is similar to that of the Organisational model (OD) (Senior and Swales, 2010), integrating feedback loops which allow for the cyclical nature of change. It also encourages a formative evaluation approach, throughout the process, which allows for method and processes adaptation, in response to unexpected behaviours or outcomes (McAuliffe, 2000). This promotes continuous improvement in a manner analogous to Deming’s PDSA Cycle (1986).
Although the four stages within the HSE model are presented in chronological order, the model encourages flexibility between interrelated stages (HSE 2008) in recognition of the dynamic and chaotic nature of change within the health services (Karp and Tveitesaas Helgø, 2009; Marchal et al., 2012). This approach is contrary to Kotter’s (1996) theory that “Leaders who successfully transform businesses do eight things right and must do them in the right order”. However, many of Kotter’s theories have been incorporated into the HSE model; for example ‘developing a sense of urgency’ and ‘creating a shared vision’. These steps are integral to ‘building a commitment’ and are essential for staff engagement.

Clarke and Clegg (2000) suggest that the manner by which employees are encouraged and supported to become involved in a change process is considered to be the determining factor for the success or failure of a project. The literature review had provided evidence that the most effective antibiotic stewardship programs actively engage and involve the clinicians (Cisneros et al., 2014; Gerber et al., 2013; Niwa et al., 2012) The participative methodologies recommended within the HSE model which are analogous to the Soft OD approach described by Senior and Swales (2010) seemed appropriate to the needs of the ASP.

The HSE model is an evidence based hybrid type model which was developed specifically for the HSE by internal change experts (H.S.E, 2008). Whilst some may consider the fact that the HSE model is tailored toward the specific needs of Irish Healthcare as a limitation, in fact, for the
purposes of this change project, this is a distinct advantage. It should enhance the sustainability and further rollout of the project as the model is easily accessible and, according to the HSE, is well supported within the organisation (H.S.E, 2008). However, although the HSE change hub provides many examples of projects which have been successfully implemented using this model; regrettably the author could find no evidence in the literature to support these claims. It is of additional concern, that anecdotal evidence from HSE staff suggests, that the model is virtually unheard of in many areas and that the support for it seems dependent on discipline and geography. The four key stages of Initiation, Planning, Implementation and Mainstreaming do provide a consistent approach to change within the HSE but, if the model is unsupported, a change agent who has no background in change management might become overwhelmed with the vast array of tools and steps within the template.

Nonetheless having given full consideration to the potential limitations of the model, the author still concluded that the HSE model was a comprehensive fit for the organizational change (Burke, 1994) and, as a result of knowledge gained during her Masters program, would be ‘understandable and feasible’ for her to work with (Burke, 1994).
3.4 The four Stages of change within the HSE Model

‘Fail to plan, plan to fail’ (Gogler, 2005)

The Initiation and Planning stages of the HSE model provided direction and structure to the development phase of the process.

3.4.1 Initiation Stage

This preparatory stage, determined the ‘purpose and mandate’ for change (H.S.E, 2008). The literature review was an integral to the Initiation, as it firmly established the rationale for change. It was then critical for the author to consider the mandate for change. This required an analysis of the many
internal and external factors which could influence the initiative. She also considered the potential impact the change may have on the service, the organisation and the numerous stakeholders. The author used a number of strategic tools to explore the various factors.

**Force field Analysis**

Considerable driving forces had been identified in the literature review, but the author recognised the need for more insight into the competing restraining forces and therefore carried out a Force Field Analysis (Lewin, 1951) Appendix 1. Schwering (2003) describes this analysis as a ‘problem solving technique’ which examines the opposing forces ‘for and against’ change. Although the driving forces may have appeared dominant, the force field analysis identified the ‘culture of clinical independence’ and the ‘lack of current clinical audit’ as key restraining forces which had the potential to impact on staff engagement. The literature review identified that ASPs are ineffective unless they engage the clinicians, who have the ultimate power to effect the change (Gerber et al., 2013) therefore these factors required further examination and proactive management.

**Culture and Resistance**

To consider potential staff resistance, it was necessary for the author to explore the organisational culture and how it might impact the change project. The HSE model emphasises the importance of “Understanding the cultural and people aspects of change” recognising it is important to
address the concerns and needs of individuals and the team from the outset (HSE, 2008). It is recognised that culture eats strategy for breakfast, therefore, even well planned projects, can be totally undermined if the change is not in keeping with the organisational culture.

Using a Goffee and Jones model (1998)(Appendix 5) the author analysed the culture of her service and found it to be ‘Networked’ as it scored highly for sociability but lower on the solidarity scale. The dominant culture within the department creates a positive informal environment, conducive to sharing ideas, supporting effective easy communication and loyal friendships within teams. However highly networked subcultures (local teams) have evolved, which have contributed to cliques and occasional conflict. Powerful individuals, within these cliques, often chose to work against management and have previously shown resistance to any change that they considered might interfere with their work practices.

At the early stages of the program two such individuals were very vocal in their opposition to the program. They openly dismissed the dental role in antibiotic resistance as minimal and were very emotive about patient care issues. They indicated that they would resist any perceived interference with their clinical autonomy. It is well recognized that Healthcare professionals can be resistant to change (Kumar, 2013) for these dentists; this perceived affront to their clinical autonomy could be considered a challenge to their espoused values (Schein, 1985).
Having identified these cultural influences and recognised the potential source of resistance the author put a plan in place to address this issue. In advance of the first Education session she recruited senior clinicians as a guiding coalition; their vocal support in a public forum influenced others towards a shared vision for change and diluted the potential negative effect of the clique culture. Additionally as suggested by Kumar (2013) the author approached the most resistant dentist individually in an attempt to encourage him to buy into the process. She used methods of rational persuasion as described by Falbe and Yukl (1992), explaining the need for change and the potential positive outcomes. As he held a position of informal power within the group and had the ability to persuade others of the merits of the change, his buy in was critical. Creating a ‘felt need for change’ (Lewin, 1947), even with just this one individual, was a positive step towards staff acceptance.

The author also realised the benefit of redirecting resistance as described by Cohen (2006) once the issue causing the resistance is identified. For example, inadequate time for extractions during emergency appointments was one justifiable barrier, highlighted by the staff. By identifying this and arranging to address it, by introducing an increased time slot for emergencies, she was seen to value and respond to staff concerns, thus creating a as a positive drive for the change, through collaboration and shared learning.
Stakeholder analysis

Having identified the culture and considered potential resistance from within the department, it was important to identify all of the potential stakeholders and to consider how they might influence or be affected by the implementation of the ASP. According to Freeman (2010), stakeholder response to change is the single biggest factor impacting a change process outcome. All of the stakeholders were listed and then positioned on a power grid (Appendix.4) as described by Savage et al., (1991) which helped pinpoint those of high influence and power. Identification of the Resistors and Drivers for change within this group, allowed the author to address resistant groups and simultaneously target supporters such as the aforementioned Senior Dental Surgeons to form coalitions. The ISA Manager and management in the National Oral Health Office were identified as essential to the change initiative, as the author was aware that commitment from senior management is one of the successful drivers for change (Jackson, 2005). Their involvement was of particular significance, not only because the National Oral Health Office was launching the Irish Prescribing Guidelines, but additionally and perhaps more importantly, because they held the power to decide on any future role out of the project.
SWOT Analysis

A SWOT Analysis (Humphrey, 2005) (Appendix 2) was undertaken as it enabled the author to consider strengths, weaknesses, opportunities and threats internal and external to the project. A key opportunity it highlighted was a pre-H.I.Q.A. audit, due to take place in the first quarter 2015, which could ‘create a sense of urgency’ amongst the staff (Kotter, 1996). This turned out to be a critical leverage point (Smith, 2011) which added beneficial momentum and increased motivation, as staff wanted to show evidence of good practice in the area of antibiotic stewardship. At the time of the SWOT analysis, the launch of the Irish Guidelines for prescribing in dental practice was already delayed. Identifying this issue as a threat allowed the author to plan for the possibility that the guidelines would not be launched in time for the education program.

Although the author found the SWOT Analysis useful it is worth noting that Johnson et al (2008) consider the SWOT tool to be very limited in its use, as it gives no importance weighting to the identified issues, which would allow for more in depth analysis.

PESTLE Analysis

The author also carried out a PESTLE Analysis (Aguilar, 1967)( Appendix 3) to explore the ‘broad macro environment’ (Johnson et al, 2008), including those external issues or groups which might be considered a potential threat to the organisation (Senior and Fleming, 2006).
moratorium on staff recruitment was identified as one of the key external issues. The author recognised that the resultant burden on existing staff had the potential to lower morale, which would possibly increase resistance to change (Laker et al., 2014). As the success of the change process was reliant on buy in from the dentists, the author had to ensure that she provided the necessary supports to make certain that the change did not overly impact on their work load.

Leadership style

In order to be an effective change agent it was essential that the author also explored the potential for her own leadership style to impact of the change process. West et al. (2015) have described how the behaviours of leaders within healthcare have a direct impact on the well-being and satisfaction of the staff they supervise. Recognising this, the author realised that it was her responsibility to promote change in a positive fashion, perhaps to emulate the qualities of the transformational leader, leading change by example and energizing staff towards a higher vision (Bass, 1985).

As suggested in the HSE Model (2008) the author had to be open to personal development. To date her leadership style relied on personality traits such as energy, drive and enthusiasm, not unlike the Transformational Leader, but she had become aware that her style had
been very reactive in nature and lacked structure. Burke (2004) recommends that change leadership should be structured, incorporating strategy and planning. The use of the HSE model provided precisely the structure that the author needed to support her through the change. It enabled her to learn and practice skills which will be invaluable for future change leadership. The literature suggests that the development of leadership skills is a life-long activity (Tomlinson, 2012) and, for the author, the experiences and learning from this change project was part of that journey.

Having analysed the many influencing factors which were relevant to the proposed Stewardship Program, the final phase of the Initiation stage was the development of a strategic plan, incorporating concrete Goals and Objectives (as outlined in Chapter 1) which signposted the potential outcomes and benefits of the project. This project proposal was required for the academic institution in advance of project approval and also was essential, both for ethics approval within the HSE, and to gain senior management support for the initiative. The author consulted the ISA manager and National Oral Health lead who were both very enthusiastic in their approval and support for the proposal. This type of political consciousness and strategic thinking and planning, which are essential for coping with the dynamics of health care management (Swayne et al., 2012) had required a mind-set shift for the author but was indicative of her personal leadership growth.
The author found that the time she invested at the ‘Initiation’ stage of the change process had been very valuable preparation; she had explored the culture of her department and gained insight into how she should deal with potential resistance. She identified the main stakeholders and considered the leadership style and approach she should adopt to ensure change acceptance.

3.4.2 Planning stage

Having gained management support and built coalitions amongst the Senior Clinicians, it was time to share the vision with the rest of the staff.

In order for the vision of change to be supported from the outset (Kotter, 1995) the staff needed to understand the rationale for change. Rosemann and Vom Brocke (2015) highlight that staff regard change as stressful and demanding and suggest that good communication is essential to deal with this challenge. The author realised that in order for communication to be effective it was crucial for the staff to be presented with a comprehensive proposal which would incorporate an assessment of the current situation and an implementation plan.

The author complied all the relevant information including the KPI target data for two months, the base line measure of antibiotics, the rationale for change, the aims and objectives and the literature relevant to effective stewardship programs to formulated her implementation plan. This was
then presented to the staff at the first education session to encourage buy-in to the change project.

The literature supports the view that communication is crucial to successful change management (Hargie et al., 2002 LeTourneau, 2003). Kitchen (2002) argues that the methods employed to announce, explain and prepare people for the change is central to acceptance. This supports Quirke’s (1995) view that employee communication does not have ‘a role’ in managing change; but that it has ‘the role’, and is central to building commitment and reducing resistance. It is recognised that one sided communication, (such as memos or email), can be ineffective, unless combined with more direct approaches (Jackson and Lichtenstein, 2011). Stonehouse, (2012) agrees, suggesting that one to one communication is a worthwhile approach, as it is open and inclusive, establishing an environment of respect and value between management and staff. The author considered this evidence when planning her communication and adopted a number of evidence based approaches.

She chose to launch the initiative at an education session presenting the implementation plan, an analysis of the current situation and the implications of antibiotic resistance for dentistry. Additionally she planned to further communicate by meeting with the smaller practice teams and by providing targeted individualised interventions for high prescribing clinicians. During this planning stage she was ‘Unfreezing” (Lewin, 1947) and creating an awareness and readiness for change.
3.4.3 Implementation

As identified within the literature review ASPs are not effective if they involve Guideline introduction or education without additional support (Cisneros et al., 2014). Therefore, a multifaceted approach to implementation was adopted, which incorporated a number of initiatives based on those programs discussed in the literature review, which had been found to be successful.

Key initiatives

- Introduction of evidence based guidelines (Lübbert et al., 2014)
- Education sessions provided by a senior clinician (Niwa et al., 2012)
- Individualised feedback to high prescribers (Martens et al., 2007)
- Implementation of an antibiotic ledger which enabled clinical audit with direct feedback to staff (Arnold and Straus, 2005)
- Ongoing monitoring of KPI targets
- Ongoing monitoring of prescription numbers
- Ongoing education, staff meetings, clinical conferences and emails

There were two education sessions, the first of which was designed to launch the initiative. At this session a senior clinician presented evidence regarding the responsibility and role of the dental practitioner in the reduction of antibiotic resistance. The data relating to the poor adherence to KPI targets and the variance in the percentages of antibiotics being
prescribed by the different dental practitioners was presented in anonymised graph format (Figure. 1).

The author and her Senior Clinicians were met with significant resistance at this first session. A number of staff had been approached prior to this first meeting and they were open in their support for the project, which provided reinforcement for the senior team and assisted in addressing the vocal resistance at this session. Overall the education session had a positive outcome. The creation of these early coalitions had been critical to the successful launch of the project. A sense of urgency had been created. Even just raising awareness had an impact on prescribing patterns as will be detailed further in the evaluation in Chapter four.

The new Irish Prescribing Guidelines and the antibiotic ledger were scheduled to be introduced at the second education session. As identified in the SWOT analysis, there was the potential for the Irish Guidelines to be delayed beyond the proposed date for the second education session, which was to be held in December. Unfortunately this threat was realised, compelling a reorientation of the session, which still allowed for the introduction of the antibiotic ledger, but necessitated the presentation of the current Scottish Guidelines (Scottish Dental Clinical Effectiveness Programme, 2011) as an equivalent evidence based standard.
Over the period of 9 months (June – March) the key activities of the change project were rolled out. The author remained actively engaged, meeting with smaller teams and with individuals. Changes were monitored and staff were encouraged and supported. Feedback was sought and suggestions were incorporated into the program, which not only improved the process, but enhanced staff commitment (Senior and Swales, 2010). The success and limitations of the various activities and approaches will be explored further in the Evaluation and Discussion chapters.

3.4.4 Mainstreaming

The Mainstreaming Phase involved the reinforcement of change, in order to ensure sustainability. Lewin (1951) would describe this stage as ‘Refreezing’ in a new state in order to make it permanent, integrating the change into work practices and making it “the way we do our business” (H.S.E., 2008). A critical point in the mainstreaming phase was the positive feedback received from the Pre-H.I.Q.A.audit, which identified the Antibiotic Stewardship Program as good practice. This type of recognition maximises staff commitment and should be encouraged (Senior and Swales 2010). However the literature recognises that successful change processes take time (Doppelt, 2009; Kotter, 1995; Smith, 2011). The evaluation, which will be discussed in Chapter four, provided evidence of successful change, but also identified areas where improvement will be
required. To that end, the mainstreaming phase must be ongoing, the author plans to feedback the results of the evaluation to the staff acknowledging the successes to date and highlighting the need for further improvement. The sustainability of the program in this ISA is dependent on the continued monitoring, the auditing of prescribing practices and the maintenance of feedback to clinicians who are not adhering to best practice. The potential role out to other area will require support of senior management within the National Oral Health Office.

3.5 Summary

This chapter described the various methods used within the Antibiotic Stewardship Program to influence the prescribing practices of the dentists involved. The many change management challenges and the advantages of using the HSE model as a framework for change, were discussed. It also explored the significance of the methods employed to engage staff and senior management. The current literature informed not only the rational for change but also the change approach and the methods and the leadership style adopted by the author.
Chapter 4   Evaluation

4.1 Introduction

This chapter will explore the definition of evaluation and its significance within healthcare. It will discuss the various approaches and models that the author considered when choosing a suitable evaluation framework. Finally, the results and available data will be examined to decide if the Aims and Objectives have been successfully achieved.

4.2 Evaluation definition

Evaluation is a structured process which assesses the value or effectiveness of an initiative (Belling, 2013). Scriven (2007) described it as a “determination of merit, worth or significance”, whilst Lazenbatt (2002), considered it to be a measure of the “extent to which an intervention achieves its stated objectives”. Green and South (2006) expand this theory, agreeing that evaluation can validate that a change has met its objectives, but suggest that it should simultaneously assess any unintended change and identify gaps to inform improvements. Kahan and Goodstad (2005) recommend a more formative approach, outlining how evaluation ideally reviews processes and activities as part of a cycle of continuous improvement. The WHO(2013) highlight the importance of the summative evaluation which should allow for lessons to be learned and
improvements to be made, in advance of any future dissemination, further recommending that areas of excellence should be recognised, promoted and shared. The literature suggests that, although there are multiple theories of evaluation, a precise definition is unimportant (Patton, 2002) and in fact the author has chosen a combined evaluation approach as recommended by McNamara et al (2010).

4.3 Significance of evaluation in healthcare

Irish Health Services are undergoing very significant change and the provision of a safe, effective, quality service is at the heart of this transformation. It is essential that management have access to relevant, reliable, evaluations to inform their decisions regarding service improvements. According to De la Harpe and Kavanagh, (2007) “the right thing must be measured in the right way if it is to underpin the right decisions”. If health services are to improve, outcomes must be measured, programs should be evaluated and only effective evidence based initiatives should be continued or disseminated.

Many health care improvement programs are underway throughout the world. Leaders must be accountable to provide clear visible results in order to identify which have been successful, so that they can be replicated (Parry et al., 2013). Cohen (2006) points out, that a good leader should also accept and concede when an initiative is not effective. Evaluation is
not about blame (WHO, 2013), it is a learning experience which should provide a “sound evidence base for decision-making in policy and practice” (Cooke, 2005)

Regrettably Øvretveit (2011) suggests that of the very many health care initiatives launched annually very few are evaluated. This may result in the same mistakes and ineffective initiatives being reproduced. Kieran and Judith (2011) have emphasised the importance of research-informed practice, outlining the link between this and successful program outcomes. But unfortunately Hamer and Collinson (2014) suggest that much of current health care practice is not grounded in evidence. Conry et al’s., (2012) systemic review of 10 years of health improvement initiatives substantiates this view, describing a high percentage of the initiatives reviewed as ‘poor quality’ and not meeting current evidence based standards. This underlines the importance of the use of evaluation data as a basis for both policy decisions and research based practice.

The current demand for value for money in public services has required evaluation to evolve to consider not just measurable outcomes, but also processes, stakeholder input and value and quality (McNamara et al., 2010). Managerial accountability is key to ensuring that we are “doing the right thing in the right way” (Schwandt, 1998) and at the right price! This is in keeping with the Department of health’s strategic framework for health reforms ‘Future Health’ (2012) which emphasises the importance of evidence based services and value for money. If the evaluation could
validate the effectiveness and potential cost benefits of this ASP, it would be provide an additional reason to consider its dissemination to other Dental Areas.

4.4 Evaluation Standards

Having established the importance of evaluation for her program, the author planned her evaluation by initially considering standards as outlined by the American/Canadian Joint Committee on Standards for Evaluation (2011). These standards recommend that evaluations should be feasible, ethical, accurate and useful. They additionally highlight the importance, clarity of purpose and perspective within the evaluation.

4.4.1 Feasibility

Donabedian’s (1966) seminal article describes an approach to evaluation which assesses structure, process and outcome. Unfortunately, it is not always feasible to implement this type of multi-layered evaluation due to the many resource limitations placed on new programs. Ideally, all health care initiatives should measure improved patient outcomes, but often this is not realistic, as it may require longitudinal studies outside the scope of many programs (De la Harpe and Kavanagh, 2007).
The ultimate outcome for this program would be a reduction in antibiotic resistance, but this would be impossible to measure. However, any reduction in the number of antibiotics prescribed could be a measurable outcome. This, combined with the achievement of the other SMART objectives, was considered the most practical method by which to determine the success of the change implemented (Lazenbatt, 2002).

In keeping with Donabedian’s theories, the current literature underlines the importance of process evaluation to examine those factors which hinder or facilitate the desired intervention outcome (Nielsen and Randall, 2012). This qualitative approach would align with the people centeredness of the HSE Change Model. The prescribing practices of the dentists is central to this antibiotic stewardship program. Evaluating the dentists’ behavioural changes would require analysis of the barriers and facilitators of change (Charani et al., 2011). This type of evaluation would be extremely valuable for future program design. Regrettably, it was not feasible within this program, but the author would recommend it as an area for possible future research.

4.4.2 Ethics

The author adhered to the principals outlined within the Data Protection Act (Irish statute, 1998) and the Data Protection Act amendment (Irish statute, 2003) when planning the program. Consideration was given to any
potential ethical issues such as participant’s consent, anonymity of patient and staff details and confidentiality of data. A copy of the project proposal was sent to the Research and Ethics Committee within the HSE and the author received confirmation that ethics approval was not required for the project.

4.4.3 Accuracy

All of the data was collected from 3 sources:

- **SOEL Health**
  
  Electronic patient chart used by clinicians to record contemporaneous patient notes

- **KPIs (Appendix. 8)**
  
  Recorded electronically, daily by the clinician

- **Antibiotic ledger(Appendix.7)**
  
  Recorded manually by the clinician

The dental council code of practice (2012) states that dental records must be accurate, “valid, reliable, timely, relevant, legible and complete”.

Furthermore, HIQA (2012) recommends that staff should regularly audit health care records as part of quality assurance. However the literature suggests that there are issues (Astekar et al., 2011; Brown, 2014) with the quality and accuracy of dental records worldwide.
It was outside the scope of this program to audit the data recording of each clinician. The author recognises the potential for a certain degree of inaccuracy in the collection of the data and accepts this as a limitation of the evaluation. However, it is worthwhile to note that the analysis which was based on SOEL Health and the KPIs would be reproducible and verifiable, as both are National Systems. This could be extremely informative if the program were rolled out further, as there would be potential for comparison between Dental Areas.

4.4.4 Usefulness

The processes and outcomes of any evaluation have to be meaningful and persuasive, if they are to have any useful impact. Lohan and Kelly (2013) have suggested that there are key questions at the heart of healthcare evaluation: ‘What you are looking for?’ and ‘How will it improve the patient’s care?’ In answer to these questions, the relevance of the summative evaluation for program improvement and dissemination purposes has already been discussed and the link between research based programs and positive health outcomes has also been established (Kieran and Judith, 2011). In addition to validating the effectiveness of interventions, Perry (2013) recommends that evaluation should incorporate a formative approach. This type of ongoing evaluation can provide an
understanding of how the initiative is progressing and allow identification of early problems to ensure continuous improvement.

This rapid cycle evaluation approach was implemented in the form of informal feedback from the dentists during one-to-ones with the change agent and other Senior Dental Surgeons. The knowledge gained provided valuable information for ongoing program improvement. For example, at an early stage in the process, one dentist suggested the incorporation of a justification section into the antibiotic ledger. The author included this idea in the program and it became a key component of the initiative.

4.5 Aims (Purpose and Perspective)

From the outset it was apparent that the purpose and perspective of the evaluation were interwoven. The primary purpose of the evaluation was to assess effectiveness with a view to improvement and potential future roll out. It was critical that the evaluation would provide relevant information to stakeholders with the power and influence to initiate and resource any necessary improvements and disseminate findings. It was therefore considered appropriate for this program to be evaluated from a management perspective.
4.6 Evaluation Models

Many different models and frameworks have been proposed to address the process of evaluation. Most program evaluation experts agree that there is no one best model (Mc Namara et al 2010). Payne (1994) recommends the use of a model that best fits the specific needs or situational characteristics of the program, while Kahan, (2008) recognises that it is not necessary to stick strictly to one approach and that it is often appropriate to combine elements of different approaches or adapt a model to suit local conditions.

4.6.1 Kirkpatrick Model

The author examined a number of models including the Kirkpatrick’s model (1994) which is a four step linear model that is considered valuable for use in training evaluation (Rouse, 2011). As this ASP involved two training sessions, Kirkpatrick might have appeared to be the obvious choice. However, this model has been criticised for singularly focusing on the training intervention (Alliger and Janak, 1989) ignoring other concurrent activities, such as the individualised feedback or the implementation of the antibiotic ledger. Additionally, Kirkpatrick’s linear approach could be counterproductive to this change effort as it would not allow for the cyclical feedback central to the formative evaluation. Finally, considering the view that that education alone is not an effective method of Antibiotic
Stewardship (Cisernos et al, 2014), this model may not be as appropriate as it first appears.

4.6.2 CIPP model

The CIPP model (Stufflebeam, 1971), which incorporates Context, Input, Process, Product (Outcome), is well commended within the literature (Fitzpatrick et al., 2011; Mertens and Wilson, 2012). It provides a systematic, detailed, yet flexible approach to evaluation, which takes into account a wide range of environmental factors and would align well with the HSE model. However the model has been criticised for being time consuming (Kahan, 2008) which was one consideration for the author. Additionally, the CIPP model’s emphasis on the importance of process, did not align well with the primarily outcome based focus of the evaluation.

4.6.3 Goal Based Model

A Goal Based model was also explored as ultimately it is the measurement of what has changed or improved that demonstrates the success or failure of the initiative to the organisation and stakeholders (Kaplan and Norton, 1996). This type of model measures the effectiveness and efficiency of the initiative, assessing against clear, time bound, measureable goals or
objectives (Hansen, 2005). The author decided that this method was well suited to the planned summative evaluation for the program.

This approach has been criticised for disregarding unanticipated effects (Mickwitz, 2003). However, the author believed that the incorporation of any unexpected collected data as suggested by Walden and Baxter (2001) could counteract this weakness. The UK Government Social Research Unit (2007) points out that the Goal Based approach does not assess whether the “chosen goals are appropriate measures of effectiveness”. This maybe a valid critique but, within this program, the Objectives are closely linked to the Aim of the project and therefore should be legitimate measures of success or failure.

The Goal Based model maybe very simplistic but combined with the PDSA cycle approach (Deming, 1986), which allowed for the formative continuous improvement feedback, it provided a framework that was useful and appropriate and did not add unnecessary layers of complexity to an evaluation which was primarily objective orientated.
4.7 Methods & Measures

There are four simple steps in the development and implementation of the Goals Based approach (Kahan, 2008) which are detailed below.

4.7.1 Getting Ready

In keeping with the HSE change model the Goal Based approach emphasises the importance of designing the evaluation at the start of the program (Jeanfreau and Jack, 2010; Morrison, 2003). The author considered the evaluation from the outset, in particular when setting the SMART objectives and identifying the expected outcomes. It was critical that they were relevant and measurable in order to produce significant results which could validate the effectiveness of the program (Belling, 2013; Scriven, 2007)

4.7.2 Planning

Having established the design, purpose and perspective of the evaluation, the methodology required further planning. All of the dental surgeons in the ISA were included, which gave a sample size of 15. The data collection, as already mentioned, relied on clinician input. Some of the data was entered into the electronic patient record and the KPIs were collected on excel spread sheets. These records allowed for the collection
of antibiotic numbers and numbers of emergency patients seen. This reporting and analysis was done on a monthly basis throughout the nine months of the program. The antibiotic ledger was filled out by hand and therefore required manual counting and analysis, which took place at the end of March, three months post implementation. The ledger provided data relating to guideline adherence.

The National Institute for Clinical Excellence (2002) defines clinical audit as: “a quality improvement process that seeks to improve patient care and outcomes through systematic review of care against explicit criteria”. Both the KPI targets and guideline adherence (as recorded in the antibiotic ledger) could be evaluated by audit, as they fulfil the criteria. However the number of antibiotics prescribed per month or the percentage of antibiotics prescribed to emergency patients could not be audited, as there was no standard to compare to. Instead, these measures were used to draw comparisons and show trends, which was also useful when establishing the success of the program.

As the KPIs had only been introduced in April and the first education session was held in June, unfortunately the pre-intervention data incorporate only two months. This was poorly planned as, had the education session been even one month later, the base line measure of three months, pre intervention, would have given more weight to the results and established more of a base line to compare to. On the other hand, the implementation of the antibiotic log was perhaps too late, as
there is only one three month period (Jan – March) to assess. This did allow for an audit against the Guidelines. However, had there been time to give individual feedback to clinicians and repeat the audit cycle, the evaluation would have been able to assess, with more validity, the success or failure of the guideline implementation. The author recognises that, although the evaluation was planned from the outset, inadequate consideration was given to the data collection and the timing of interventions and how they would impact on each other.

4.7.3 Implement the Evaluation Plan

The first measurements were recorded in advance of the initial education session. These measurements included the percentage of emergency patients receiving antibiotics, per dentist (Figure. 1) and the overall numbers of antibiotics being prescribed per month (Figure. 4). This data provided a comparative baseline measure, but additionally highlighted wide variance between prescribing dentists, suggesting potential clinical risk. These, along with the compliance figures for the newly introduced KPIs, were presented at the first education session. Although the graph showing the differing prescribing levels (Figure .1) was anonymised, it raised awareness of the issue and created a 'sense of urgency' (Kotter, 1996) amongst the dentists who recognised the need for change.
The ongoing monthly measurements, recorded throughout the program, provided formative evaluation which, using the PSDA cycle (Deming, 1986), allowed for feedback targeted towards those individuals who had the highest prescribing figures.

The summative evaluation analysed the final measurements of the prescription numbers, the measurement of KPI targets and the antibiotic ledger audit results. As previously discussed the audit of the ledger was once-off. The author would recommend repeated audit cycles with feedback as recommended in the Mainstreaming phase of the HSE Model to maintain the gains made and to encourage further improvement (Bryce et al., 2007).
4.7.4 Analysis/Results

The analysis measured the achievement of the Smart Objectives as:

**TABLE 1**  SMART OBJECTIVES 1-3

<table>
<thead>
<tr>
<th>Objective</th>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff attendance at education program (by Dec 2014)</td>
<td>Achieved</td>
<td>There were two education programs - one in June and one in December. Thirteen of the dentists attended in June and 12 attended in December. The objective was achieved as none of the 15 sampled dentists missed both sessions.</td>
</tr>
<tr>
<td>Design and implement antibiotic ledger (by Dec 2014)</td>
<td>Achieved</td>
<td>The antibiotic ledger was designed (Appendix.7) by the author and was introduced to the staff at the December education session for implementation as of the 1st January 2015.</td>
</tr>
<tr>
<td>Audit of antibiotic ledger, guideline adherence and KPI (by March 2015)</td>
<td>Achieved</td>
<td>Of the fifteen sampled dentists all of them used the ledger in the period over the three month period. However the ledger was launched for implementation on the 1st of January and two thirds of the clinicians did not start using it immediately. Five of the clinicians started to use it from the outset, but the other ten had a staggered start time, with one or two only starting in March, in advance of the pre-HIQA audit. From an evaluation perspective the audit results are no less valid, as the audit measured guideline adherence. The ledgers provided the details of 104 prescriptions, which was adequate for this purpose.</td>
</tr>
</tbody>
</table>

**Audit results**

**TABLE 2**  ANTIBIOTIC LEDGER AUDIT

<table>
<thead>
<tr>
<th>Use of ledger</th>
<th>62%</th>
<th>Over the three month period 169 prescriptions were written, however the ledger only recorded 104 prescriptions because 66% of the staff did not start using the Ledger until February/March.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completion</td>
<td>100%</td>
<td>All of the 7 sections of each ledger entry, 100% were filled out completely for each entry that was made.</td>
</tr>
<tr>
<td>Antibiotic Choice</td>
<td>100%</td>
<td>All of the antibiotics prescribed were narrow spectrum antibiotics as recommended in the guidelines</td>
</tr>
<tr>
<td>-------------------</td>
<td>------</td>
<td>---------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Dosage</td>
<td>82%</td>
<td>Of the 104 prescriptions analysed 19 had the incorrect dosage. According to the Scottish guidelines the recommended dosage of amoxicillin for a child over 5 years is 250 mg, three times a day for five days. In ten recorded cases the children were over five but were prescribed the lower dose of 125mg. In the other nine cases the children were under five years of age and were prescribed 250 mg. All of the higher level dosages were prescribed by one clinician and the dosages which are low were prescribed by two clinicians. This valuable information, which would not have been gathered except for the ledger audit, will allow for targeted feedback to encourage best practice which can be re-audited at the next cycle.</td>
</tr>
<tr>
<td>Antibiotic Justification</td>
<td>63%</td>
<td>When the ledger was circulated by email following the December education session a list of reasons, from the guidelines, for antibiotic prescription was included and it was specified that these would be considered as the only valid entries for the clinical justification section in the ledger. (Appendix. 6) Of the 104 prescriptions, 38 did not have one of the validated justifications listed. This indicates, that either the clinicians did not fill in the section correctly or that certain prescriptions of antibiotics may have been unnecessary. Again, the audit provided useful data which the author will feedback to all staff and to targeted individuals on a one to one basis.</td>
</tr>
</tbody>
</table>
The achievement of the 95% target for the KPI relevant to antibiotic prescribing by Feb 2015

Although the target of 95% has not been achieved there has been an upward trend of compliance. It is worth noting that there was a significant improvement between May, when 62% of the targets were met, and June (following the first training session) when 80% target was achieved.

In August the percentage dropped to 73% but, as the KPI is linked to the timely access of an appointment, post antibiotic therapy, this dip could be explained by shortage of appointment slots due to holiday leave.
Since September all targets have reached 80% or over, twice achieving 90% compliance. As part of the mainstreaming process, there will be ongoing reminders about adherence to targets, with the aim of achieving 95% compliance.

- **Reduction of the number of antibiotics prescribed by clinicians (by March 2015)**

![Number of Antibiotics Prescribed](image)

**Figure 4**  **Number of antibiotics prescribed by month**

As the graph above displays, the numbers of antibiotics prescribed has shown a downward trend over the nine month period. The most notable decrease is recorded in June 2014 which is very positive as the first Education session took place at the beginning of June. It is of some concern that there seems to be a spike in January 2015 just following the launch of the Guidelines and the Ledger.
However as Dental Services are closed for a considerable period over the Christmas holidays, those requiring emergency appointments would have been waiting until the first week in January which would have impacted on the number of antibiotics which needed to be prescribed in that time period. The graph below displays the antibiotic numbers as a percentage of the emergency patients seen and this shows a much less dramatic increase in January which is consistent with higher numbers of emergencies arriving in January.

**Figure 5  Percentage of Emergency Patients Prescribed Antibiotics**
Overall the trend is positive and it is particularly promising that the lowest numbers recorded were in Feb and March 2015 when the majority of the dentists started using the ledger. The Figures from January –March were further analysed to consider the individual prescribing patterns of each clinician. As shown in the graph below, all of the 15 dentists sampled were prescribing antibiotics for a lower percentage of their emergency patients. There is still a variance from 6% to 27% between the lowest and the highest prescribers, which is evidence that there is definite room for further improvement. However, it is noteworthy that dentist ‘L’ has reduced from 43% pre-intervention to 14% post intervention, which demonstrates that the program has the potential to change prescribing practices.

![Bar Chart]

**Figure 6**  **Comparison of Percentage of Emergency Patients Receiving Antibiotics Pre and Post Intervention by Individual Dentists A-O**
Nonetheless, it is too early to decide definitively whether the ledger and guidelines will prove to be an effective stewardship program. The next audit cycle and continued monitoring of prescription numbers will provide data for further evaluation.

**4.7.5 Report**

Overall, the project objectives were achieved. The Education program took place; the ledger and audit were designed and implemented. Additionally, the numbers of antibiotics prescribed decreased and the KPI target percentage whilst not reaching the 95%, did show significant improvement. However, the aim of the ASP was not only to reduce the number of antibiotics prescribed, but additionally to ensure that antibiotics prescriptions were in line with best practice guidelines. The audit of the antibiotic log showed good practice in the area of antibiotic choice, but suggest that further improvements are required in adherence to the guidelines, in relation to dosage and justification.

**4.8 Dissemination Plan**

Significant improvements in prescribing practices were made and the author intends to give feedback to staff, presenting the results of the Evaluation at the next staff meeting in May, aiming to sustain current progress and encourage further adherence to best practice. Ongoing
evaluation will facilitate reflection and generate learning to inform future planning (Coghlan and Shani, 2013). The potential for dissemination of the ASP to other dental areas will be dependent on senior management within the National Dental Office. They have been aware of this project from the outset and the author has arranged a meeting with them to present the evaluation findings and her recommendations for future role out.

4.9 Conclusion

The discussion in this chapter explored the importance of evaluation in healthcare with particular reference to this project. Although the evaluation data validated that the change met many of its objectives (Green and South, 2006), it also highlighted areas of poor practice which will feed into the cycle of continuous improvement.
Chapter 5  Discussion

5.1 Introduction

This chapter critically reviews the Change Project, examining its strengths and weaknesses. It considers the methods employed and the evaluation results, to determine the effectiveness and impact of the ASP. The author’s experience in leading this OD process is reflected upon and key learning is discussed. Finally, the further development of this project will be considered and recommendations for future research outlined.

5.2 Impact

Change is an inevitable and constant feature within any organisation (Mullins, 2010). It can be viewed as a positive opportunity for improvement or as an annoyance which has little or no impact. At this stage of the project it was worthwhile reviewing, not only the effectiveness of the initiative, but the impact that it had on the patients, staff, service, and change agent.
5.2.1 Impact on patients

The potential health outcomes for patients should be one of the main considerations when designing and implementing change initiatives within health services. The evaluation data indicated a decrease in the number of antibiotics prescribed, by the fifteen sample dentists over the nine month period, thus reducing the risk of potential side effects (Bell et al., 2014).

As evidenced in the literature review, dental inflammatory conditions, acute periapical infection, dry sockets and localised swellings, require surgical innervations as opposed to antibiotic therapy (Fedorowicz et al., 2013 and Sharif et al., 2014 and Siqueira and Rôças, 2013). To achieve the best prognosis for localised infections, when the patient is not systemically unwell, the Scottish guidelines (Scottish Dental Clinical Effectiveness Programme, 2011) recommend early surgical drainage of infection rather than antibiotic prescription. The evaluation did not collect or analyse data relating to local measures used to drain infection. However, the reduction in antibiotics prescribed would suggest that an alternative treatment such as extraction, root canal treatment or excision was used to drain the infections. Therefore, one could assume a correlation between the reduction in antibiotics and an increase in evidence based treatments, as recommended in the guidelines. Providing this active treatment in a timely fashion should reduce pain and suffering for the patient. More importantly, according to Jackson (2012), local surgical drainage would decrease the
risk of the infection spreading, thus reducing the potential morbidity and mortality associated with severe dental infections.

5.2.2 Financial Impact

The potential for serious complications from dental infections is often underestimated and has significant cost implications for the health services. It is worth noting that dental abscesses account for 47% of all dental-related ED attendances for children in America (Jackson, 2012) and that in Jackson’s US (2012) study, patients requiring hospital admission for serious complications relating to dental infections, had an average 8 day stay. Closer to home, in the UK, the most common reason for a child to undergo a general anaesthetic, is for the extraction of teeth (Robertson et al., 2012).

At the most basic level, a reduction in prescriptions will reduce the cost to HSE or the individual of the unnecessary antibiotic. However, if a reduction in unnecessary antibiotics (with the consequent increase in surgical intervention) can possibly reduce hospital admissions or GA requirements, not to mention contributing to the reduction of antibiotic resistance, then the financial implications are potentially far reaching.
5.2.3 Impact on staff

The HSE Model of change emphasises the ‘people aspects of change’. Therefore was important to consider the potential positive or negative effect that the change may have on staff. The most obvious impact is that the dental surgeons have changed their prescribing practices. All of the dentists have reduced the numbers of antibiotics they are prescribing. However the ASP impacted certain clinicians to a greater extent than others and at the end of the nine months there was still evidence of intra clinician variation in the numbers of antibiotics prescribed.

Hulscher et al (2010) suggest that there are cultural, contextual and behavioural determinants which influence antimicrobial prescribing which would somewhat explain this variation in practice. Schouten et al (2007) concur, but additionally recognise that the desire for clinical autonomy is one of the key influencing factors. A qualitative analysis to consider these factors could have been very informative, but was outside the scope of the project.

The pertinent questions would be:

- Why do certain dental surgeons prescribe more antibiotics than others, when there is no difference in case mix?
- What influenced the staff to change their prescribing behaviours and which of the initiatives were most effective or persuasive?
The first phase of the implementation, involving education sessions and feedback regarding individual prescription rates (as compared to their colleagues), which was provided by senior dental surgeons, seemed to effect change, as the rate of prescriptions dropped from June. Evidence from the literature indicates that the influence of senior colleagues on antimicrobial prescribing behaviours is likely to be significant (Cope and Chestnutt, 2014). Did the involvement of Senior Dentists, who are clinically well regarded influence change or was the individualized feedback and the comparative prescribing practices of their peers the persuasive factor? It is interesting to note that Schouten et al., (2007) suggests that peer perceptions and behaviours may have a greater influence on prescribing practices than local policy and guidelines.

As already discussed in the evaluation chapter, the antibiotic ledger audit indicated good practice in the area of antibiotic choice, but highlighted that post intervention 37 % of the justifications for prescription were not in keeping with best practice. Interestingly, this is consistent with the literature which suggests good practice relating to choice, but found inconsistencies in dosages and necessity of prescription. (Bennadi, 2013; Dar-Odeh et al., 2010a; Tanwir et al., 2013). It is premature to evaluate the effectiveness of the guideline and antibiotic ledger implementation, as the measure of its ultimate success will be linked to an increased adherence to best practice; in particular for the justification of antibiotic prescriptions; and this will require ongoing audit to validate.
However, it is noteworthy that one Dental Surgeon very honestly admitted that she was entirely aware of the recommendations for ‘justification of prescription’ prior to the education session, yet had routinely chosen to give an antibiotic ‘just in case’. She reflected that when the antibiotic ledger was introduced she felt obligated to change her practice. She ‘now had to write down a justification for prescription’. For her, the ledger was the critical factor which encouraged her to change. Interestingly, the vast majority of her justifications were in line with the recommendations.

Whilst the antibiotic prescription rates and patients’ health outcomes are of prime importance to dental services, it was important for the author to realise that the health and wellbeing of the staff providing the service should not be neglected (Basson, 2013). Therefore she had to consider not only the impact the change had on prescribing, but also the impact the change would have on the staff themselves.

As was highlighted in the PESTLE analysis (Appendix 3), clinicians are working in a highly pressured environment. The reduction in front line staff coupled with the increased demand for services is difficult enough for staff to deal with. When combined with increased hours, a reduced salary and anti-public sector sentiment, it has the potential to become demoralising and de-motivating. This workforce has been subject to a number of change initiatives (such as the introduction of KPIs) over the past 18
months and may feel ‘change exhaustion’ (Bernerth et al., 2011). Studies have reported a high prevalence of burnout among dentists (Newsome and Langley, 2014; Pérez, 2013), with issues such as anxious patients and heavy workloads being cited as ‘intense stressors’. Therefore, it was necessary for the author to recognise and address issues which could further increase the workload or stress levels.

Jackson (2012) recognised that a busy dental practice may not have time to accommodate definitive dental treatment at the initial appointment, indicating that many dentists delay active treatment by prescribing antibiotics. A high percentage of the patients treated within the public dental service are young children who can be anxious when receiving dental treatment. It can be very challenging for the dental team to persuade a small child to have a tooth extracted at a first visit, despite knowing that this is best practice. The author organised for more time to be allocated to emergency slots. However, it would be disingenuous not to recognise that this change in practice was potentially a further pressure on the workforce. Additionally, the implementation of the antibiotic ledger, which was introduced within nine months of the KPI measure, has given the Dental Surgeon yet another administrative burden.

From a governance perspective the implementation of the ledger fulfils each clinician’s responsibility to monitor and audit their prescribing practices (H.I.Q.A, 2012). Therefore when the pre-HIQA audit took place,
this evidence of good practice would have actually reduced potential stress for the clinician as they were found to be compliant.

Nonetheless, the author continued to encourage and support the staff, acknowledging the additional workload that this change may have caused. It was perhaps advantageous that this pressure affected her own clinical sessions in the same manner, so she was not removed from the impact. It was critical that she made herself available to listen to staff concerns. She was conscious that in order to ensure continued motivation and commitment the staff needed to 'be heard' (Senior and Swales, 2010).

The author was acutely aware that her communication style was crucial to maintain staff commitment (Welch, 2011) The author ensured that the feedback throughout the project was non-judgmental, but constructive, recognising and reinforcing achievements, but also highlighting areas for improvement. This was in keeping with The HSE Model (2008) and Kotter (1996) who emphasises the importance of building a 'shared vision' and acknowledging success to empower staff towards further change. She realised that as a leader, her behaviour directly impacted on the staff commitment (Cooper et al., 2014). Therefore like the Transformational Leader, it was critical for the author to win over the hearts and minds of the staff, supporting and inspiring them toward a greater good (Bass, 1985).
5.2.4 Impact on change agent

The author underwent significant personal development over the time period of the initiative. This was as a consequence of becoming the Acting Principal Dental Surgeon of the Integrated Service Area, but also as a result of the Change Project and the Masters program. Whilst it was extremely challenging to take on this new role at the same time as the change project, the author has valued the opportunity, which has increased her knowledge and awareness of leadership and management skills and highlighted her own strengths and weaknesses in this area.

As already discussed in Chapter three, the author has come to appreciate that strategy and planning are essential for effective change leadership (Burke, 1994). The use of the HSE model has provided her with a framework which clearly signposted her through the change process but additionally supported her to learn strategy and planning techniques.

Arguably, from a personal perspective, the most rewarding and useful outcome of this change project was, that the author came to realise the value of reflection. Initially she was resistant to the process as it was somewhat outside her comfort zone and she did not consider her emotional response relevant to the work place. However, as it was a course requirement, she reluctantly challenged herself to reflect on her experiences in a structured manner. It facilitated her to explore her feelings and reactions, which she discovered were situationally dependant.
This higher level of understanding allowed enhanced personal insight to her responses and motivations but also, and more importantly, encouraged her to view things from the perspective of others.

One reflection required her to focus on her communication skills and strategy. She had established that effective communication with the dentists was fundamental to the successful change (Maestre et al., 2014) and therefore had introduced the program using many communication methods. The literature had also indicated that one to one communication is a very successful approach as it establishes respect between the staff and the management Stone House (2012). Following the first education session, the author or one of her senior staff provided individualised feedback to each clinician. However, when she launched the Guidelines and the antibiotic ledger at the education session in December, she followed this up with an email with little additional supportive communication. She did meet individually with a small number of the dentists who she thought might be slower to adopt the use of the ledger, but she assumed that staff who were not vocally in opposition and who usually are ‘early adopters’ (Rogers, 1966) would not need additional support. However 66% of the dentists did not commence the use of the ledger in January and, in fact, it required one- to- one meetings with the author, combined with the leverage of the pre-HIQA audit to get the rest of the staff on board. Had she incorporated her learning into practice, she would not have relied on the email to circulate the ledger. She now
realises that the staff had competing priorities and had not placed the same importance on the ledger that she herself had. As change leader it was her responsibility to enthuse and support them and, had she just checked in with everyone, even by phone, it would have made a significant difference to the timing of the uptake of the ledger. This reflection reminded the author that, while successful change can be time consuming, time invested in evidence based approach such as one-to-one communication (Stonehouse, 2012) can significantly affect outcomes. Another paradigm shift for the author has been the realisation that her actions and leadership style may have a significant impact on her staff’s satisfaction and wellbeing, not to mention the productivity and overall success of the dept. (Gouraki, 2013). She has developed a greater understanding of her responsibility to energise, motivate and inspire her team, improving their readiness to engage in this and future change. The health services in Ireland are facing transformation. The challenge for the author is to approach this transformation in a manner which inspires her staff to engage, improving the prospect of a good outcome for all.

5.2.5 Impact on theory

The findings relating to prescribing practices of the Dental Surgeons in this program reflect the evidence from the literature review pertaining to choice/dosage/justification of prescription. As this ASP was multi-faceted, it is impossible to evaluate which initiatives were the most persuasive in changing prescribing practices, however the data does add to existing
evidence indicating that approaches which actively engages clinicians, incorporating some individualised feedback, can effect change. The use of an antibiotic ledger (incorporating justification for prescription) is something that the author found no evidence of within the literature. Although initial results are promising, it will require further evaluation to validate if this initiative is an effective ASP. This could potentially add to the knowledge base should the author publish findings.

5.3 Strengths and Limitations

The HSE Model of Change emphasises the need for continuous improvement and development and recommends as part of this process that leaders should identify the strengths and limitations of programs in order to learn from the change and establish best practice for future roll out. The strengths and weaknesses of the project have already been considered in the evaluation and discussion chapter. Nonetheless, the author found it a worthwhile exercise compiling them as it allowed her to examine them as a whole and reflect on their significance.

5.3.1 Strengths

- The ASP achieved its primary objectives.
- The ASP implemented an evidence informed, multifaceted program.
- The change adopted a ‘people centered’ approach, supported by the use of the HSE model.
• There are potential positive health outcomes for patients.
• There are potential cost savings to the individual and to the health services.
• The program has the potential to contribute to antibiotic resistance for the individual and the population.
• The design and use of the antibiotic ledger has facilitated audit and could be rolled out to other areas.
• The ASP has facilitated compliance with HIQA’s National Standards for the Prevention and Control of Healthcare Associated Infections (HIQA, 2009) and the SARI recommendations (National Disease Surveillance Centre, 2001).
• Leading the change program has provided the author with an opportunity for Personal growth and development.

5.3.2 Limitations

• Poor time planning of the first initiative allowed for only two months of figures to be incorporated into the Base line measures.
• Lateness of introduction of ledger and guidelines allowed for one audit cycle only.
• Inadequate communication strategy for the introduction of the ledger and Guidelines resulted in delayed uptake.
• Potential inaccuracy of collected data, due to dependence on clinicians’ data input.
• Evaluation was limited to output/outcome evaluation and did not incorporate process evaluation.

• No qualitative evaluation considering the factors which effect the prescription patterns of the dentists.

• The overall timing of the project required the implementation of the current Scottish Guidelines rather than the new Irish Guidelines.

Notwithstanding these limitations, the author believes that the project could be very worthwhile to roll out in other areas within the Public Dental Service, if adapted slightly to ensure better timing of initiatives and to include a more structured communication plan.

5.4 Recommendations

As part of the cycle of continuous improvement, the future of this project will include ongoing monitoring and audit of the prescription practices of the dentists in the ISA with an emphasis on the justification of prescriptions to further reduce unnecessary antibiotics.

The author intends to further develop the antibiotic ledger and to investigate the possibility of its incorporation in the computerised patient record. If it were designed to capture all the required information such as dosage, antibiotic type and justification, then it would be possible to audit on an individual, Area or National basis. This would be invaluable for measuring the trends in prescribing practices within the Public Dental
Service and could inform potential National Strategies to reduce Antibiotic Resistance. The limited scope of the evaluation within this project has highlighted the requirement for qualitative research into the factors which influence the prescribing practices of Dental Surgeons and to consider what may influence them to change these practices. The author would highly recommend this as an area for further research.

Finally, at the time of completion of this project, the new Irish Guidelines are being piloted. It would be the recommendation and the wish of the author, that some of the findings from her project might be incorporated into the implementation plan in order to contribute to Guideline uptake and use in practice.

5.5 Conclusion

This ASP has succeeded in achieving its primary objectives, but must be developed further to ensure continuous improvement in adherence to best practice guidelines. Implementing this program crystallised the theory from the Masters course for the author, underlining in particular the importance of forward planning and evidence based practice for effective change management. Undertaking the literature review, structuring the program around the HSE change model and formally evaluating the results has allowed her to put the theory into practice. The program has increased the author's awareness of the threat from antibiotic resistance and the
necessity for Dental Surgeons to recognise and act on their responsibility in this area.

In 2011, the theme of World Health Day was:

“Antimicrobial resistance: no action today, no cure tomorrow”

It is alarming that despite the publication of many relevant National and International Guidelines and Standards, the use of and resistance to antibiotics is ever spiralling (Michael et al., 2014). The literature review underlines that the publication of research and Guidelines has little impact unless we actively engage prescribers in their clinical decisions (Prior et al, 2014). Leaders in Healthcare must consider cultural, contextual and behavioural influences when designing programs and should recognise that communication methods to engage staff can impact significantly on the potential success of initiatives (Niwa et al., 2012).

Services must be held accountable for the implementation and ongoing monitoring of effective stewardship programs. It is our ethical and moral responsibility to be the gatekeepers of these life-saving drugs, ensuring their continued effectiveness to treat our future generations.

“Change will not come if we wait for some other person or some other time. We are the ones we’ve been waiting for. We are the change that we seek”

Barack Obama
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UK Department of Health, 2011. Infections and the rise of antimicrobial resistance -Annual Report of the Chief Medical Officer, Volume Two,


# Appendices

## 1 Force field analysis

<table>
<thead>
<tr>
<th>DRIVING FORCES</th>
<th>RESTRAINING FORCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evidence from literature review of increasing antibiotic resistance worldwide.</td>
<td>Culture of clinical independence</td>
</tr>
<tr>
<td>Evidence of the prescribing patterns of the dental surgeons in the ISA – in particular the variance</td>
<td>No history of clinical audit</td>
</tr>
<tr>
<td>HIQA Standards</td>
<td>Entrenched in current prescribing practices</td>
</tr>
<tr>
<td>SARI Guidelines</td>
<td>Patient pressure to prescribe</td>
</tr>
<tr>
<td>HSE Service plan</td>
<td>Time pressure due to reduced staff numbers and increased patients numbers.</td>
</tr>
<tr>
<td>Pre HIQA Audit</td>
<td>Lack of awareness amongst clinicians of the current guidelines.</td>
</tr>
<tr>
<td>Irish Dental Council Guidelines</td>
<td>Perception amongst clinicians that antibiotic resistance is not relevant to dental services</td>
</tr>
<tr>
<td>Upcoming Irish prescribing guidelines</td>
<td></td>
</tr>
<tr>
<td>WHO Call to Action</td>
<td></td>
</tr>
<tr>
<td>Governance responsibility of the Principal Dental Surgeon</td>
<td></td>
</tr>
<tr>
<td>Potential for improved patient outcomes.</td>
<td></td>
</tr>
<tr>
<td>Potential cost savings for the patient and the HSE</td>
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## SWOT Analysis

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well educated team</td>
<td>Low Staffing levels</td>
</tr>
<tr>
<td>Motivated Senior Dentists</td>
<td>Increase number of public patients</td>
</tr>
<tr>
<td>Evidence of good practice amongst some practitioners</td>
<td>Increased time pressure</td>
</tr>
<tr>
<td>Strong scientific evidence to support the change initiative</td>
<td>Evidence of poor prescribing practices amongst some of the dentists</td>
</tr>
<tr>
<td>Supportive National and international Guidelines</td>
<td>No culture of clinical audit</td>
</tr>
<tr>
<td></td>
<td>Limited Time scale for project</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>The pending launch of the Irish prescribing guidelines for dentistry</td>
<td>Potential delay in the launch of the new Irish prescribing guidelines</td>
</tr>
<tr>
<td>Pre HIQA audit –focusing staff on HIQA Standards</td>
<td>Potential resistance from Dental surgeons due to perceived threat to their clinical autonomy</td>
</tr>
<tr>
<td>Potential improved patient outcomes</td>
<td></td>
</tr>
<tr>
<td>Potential for cost savings</td>
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</table>
## 3 PESTLE Analysis

<table>
<thead>
<tr>
<th>Political</th>
<th>Economical</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHO’s call to action to reduce antibiotic resistance</td>
<td>Staff moratorium</td>
</tr>
<tr>
<td>Dept of Health’s strategic Document – Future Health focuses on evidence based health care</td>
<td>Economic climate</td>
</tr>
<tr>
<td>Public Health cuts</td>
<td>Increased public patients increasing pressure on the dental service</td>
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<tr>
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<td>Public Service pay cuts – impacting morale</td>
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<table>
<thead>
<tr>
<th>Social</th>
<th>Technological</th>
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<tbody>
<tr>
<td>Culture of patients expecting antibiotics</td>
<td>Benefit of the computerised patient record which assisted in data collection and analysis</td>
</tr>
<tr>
<td>Decrease in take home salary for patients and staff.</td>
<td>Media based public health campaigns have the potential to inform patients of the risk of antibiotic resistance</td>
</tr>
<tr>
<td>Anti Public Sector sentiment</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Legal</th>
<th>Ethical</th>
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<tbody>
<tr>
<td>HIQA Standards</td>
<td>SARI Guidelines</td>
</tr>
<tr>
<td></td>
<td>Moral imperative for health services to reduce antibiotic resistance</td>
</tr>
</tbody>
</table>
4 Stakeholder Analysis

<table>
<thead>
<tr>
<th>Power</th>
<th>Influence</th>
</tr>
</thead>
</table>
| High    | Patients/Parents  
          | RCSI        |
|         | Unions      |
|         | HR /Employee relations |
| Low     | Dentists    |
|         | Senior Dentists |
|         | Principal Dental Surgeon |
|         | HIQA        |
| Low     | Dental Administration |
|         | Dental nurses |
|         | SARI        |
|         | National Dental Office |
|         | HSE management |
|         | Media       |
5  Goffee and Jones

\[
\begin{array}{c|c|c|c}
\text{High} & \text{X} & \text{Communal} \\
\hline
\text{Networked} & & \\
\text{Sociability} & \text{Low} & \text{High} \\
\hline
\text{Low} & \text{Fragmented} & \text{Mercenary} \\
\end{array}
\]
6 Guidance for Antibiotic Ledger

The following is taken from the Scottish guidelines

As a first step in the treatment of bacterial infections, use local measures. For example, drain pus if present in dental abscesses by extraction of the tooth or through the root canals, and attempt to drain any soft-tissue pus by incision.

Antibiotics are appropriate for oral infections where there is evidence of spreading infection (cellulitis, lymph node involvement,) or systemic involvement (fever, malaise).

In addition, other indications for antibiotics are acute necrotising ulcerative gingivitis and sinusitis, and pericoronitis where there is systemic involvement or persistent swelling despite local treatment. Use antibiotics in conjunction with, and not as an alternative to, local measures.

Where there is significant trismus, floor-of-mouth swelling or difficulty breathing, transfer patients to hospital as an emergency.

There is no evidence to support the prescription of antibiotics for the treatment of pulpitis or the prevention of dry socket in non-immunocompromised patients undergoing non-surgical dental

Dental Abscess

Treat dental abscesses in the first instance by using local measures to achieve drainage, with removal of the cause where possible. Antibiotics are required only in cases if local measures have proved ineffective or of spreading infection (cellulitis, lymph node involvement) or systemic involvement (fever, malaise). Amoxicillin is usually effective at treating such infections, and is as effective as penicillin V but is better absorbed. The duration of treatment depends on the severity of the infection and the clinical response, but drugs are usually given for 5 days. Do not prolong courses of treatment unduly because this can encourage the development of resistance. For severe infections the dose of amoxicillin and Pen V should be doubled. Severe infections include those cases where there is extra-oral swelling, eye closing or trismus but it is a matter of clinical judgement.

Second-line antibiotics for dental abscess

The empirical use of other antibiotics such as clindamycin, co-amoxiclav and clarithromycin offers no advantage over amoxicillin, Pen V, metronidazole
and erythromycin for most dental patients. Their routine use in dentistry is unnecessary and could contribute to the development of antimicrobial resistance. Also the use of broad-spectrum antibiotics is associated with the increase in Clostridium difficile infection observed in both primary and secondary care. However, if a patient has not responded to the first-line antibiotic prescribed, check the diagnosis and either refer the patient or consider speaking to a specialist before prescribing clindamycin, co-amoxiclav or clarithromycin. As the use of broad-spectrum antibiotics, especially co-amoxiclav and clindamycin, can result in Clostridium difficile infection, use of these drugs should be restricted to second-line treatment of severe infections only.

When filling out justification section of the antibiotic ledger one of the list below will act as a guide.

**Justifications for prescribing antibiotics for dental infection**

- Systemic involvement-fever malaise
- Spreading infection -cellulitis, lymph node involvement, dysphagia
- Necrotising ulcerative gingivitis
- Sinusitis
- Aggressive periodontitis
- Necrotising ulcerative periodontal diseases
- Pericoronitis where there is systemic involvement or persistent swelling
- Acute periodontal conditions where drainage is impossible
- Acute situations of odontogenic infection of pulpal origin as a complement to root canal treatment
- Unable to implement Local measures –child needs GA for treatment
### 7 Antibiotic Ledger

<table>
<thead>
<tr>
<th>DATE</th>
<th>PATIENT</th>
<th>DOB</th>
<th>ANTIBIOTIC PRESCRIBED</th>
<th>DOSE/ QUANTITY/ DURATION</th>
<th>PRESCRIBED BY</th>
<th>CLINICAL JUSTIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>
## 8 KPI Spreadsheet Sample

<table>
<thead>
<tr>
<th>Treatment completed</th>
<th>Apr</th>
<th>May</th>
<th>J</th>
</tr>
</thead>
<tbody>
<tr>
<td>First sealant in a course of Tx</td>
<td>102</td>
<td>152</td>
<td></td>
</tr>
<tr>
<td>Number of sealants placed</td>
<td>315</td>
<td>610</td>
<td></td>
</tr>
<tr>
<td>Number of permanent restorations placed</td>
<td>276</td>
<td>304</td>
<td></td>
</tr>
<tr>
<td>Number of teeth extracted</td>
<td>209</td>
<td>226</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Summary Table</th>
<th>Apr</th>
<th>May</th>
<th>J</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of new patients attending</td>
<td>Scheduled assessment</td>
<td>416</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>UNScheduled assessment</td>
<td>179</td>
<td>237</td>
</tr>
<tr>
<td>Scheduled Treatment plan commenced</td>
<td>% of new patients needing further care who commenced treatment within three months of assessment</td>
<td>97%</td>
<td>99%</td>
</tr>
<tr>
<td>Scheduled Treatment plan completed</td>
<td>% of new patients whose treatment is completed within 9 months of assessment</td>
<td>98%</td>
<td>99%</td>
</tr>
<tr>
<td>Antibiotic prescribed</td>
<td>No of new patients attending for unscheduled care who are prescribed an antibiotic</td>
<td>61</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>No of new patients on antibiotics who receive a return appointment within 10 working days</td>
<td>46</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>% of new patients on antibiotics who receive a return appointment within 10 working days</td>
<td>79%</td>
<td>45%</td>
</tr>
<tr>
<td></td>
<td>Total Treatments</td>
<td>904</td>
<td>1,192</td>
</tr>
</tbody>
</table>
Abstract

This program implemented an antibiotic stewardship program (ASP) to change prescribing practices in one Public Dental Service, with the aim of reducing the number of unnecessary antibiotic prescriptions and ensuring that those antibiotics which are prescribed adhere to best practice guidelines. There is vast scientific evidence that antibiotic resistance is promoted through excessive use of antibiotics and that Dental Surgeons are contributing significantly to this issue due to their inappropriate prescribing practices. The HSE Change Model was used as a framework for the planning and implementation of this multifaceted Antibiotic Stewardship Program, which involved the implementation of best practice guidelines, clinical audit, an education program, an antibiotic ledger and individualised clinician feedback. The ASP was designed considering the cultural, contextual and behavioural factors which influence prescribing practices. Staff engagement and effective communication was identified as critical for addressing resistance and ensuring a cycle of continuous improvement. The evaluation found a measureable reduction in the numbers of antibiotics prescribed over the nine months of the program. Audit results provided evidence of adherence to best practice for antibiotic choice but, despite guideline implementation, discrepancies in the dosage and justification for prescription were found. Ongoing stewardship interventions are required to sustain progress and encourage further improvements. Recommendations have been made for further research into the factors which influence the prescribing practice of dental surgeons.
# ‘Reduce Resistance’

**An Antibiotic stewardship program to change prescribing practices in a Public dental Service**

MSc in Healthcare Management  
Student ID: 13108514

## Introduction & Background

Antibiotic resistance is promoted through excessive use of antibiotics and is considered a global threat to human health, resulting in increased morbidity, mortality and healthcare costs. Dental surgeons prescribe 9% of all antibiotics for humans and the literature provides evidence of their inappropriate antibiotic prescribing practices.  

Antimicrobial Stewardship Programs (ASP) using a variety of approaches and interventions to promoting optimum usage of antibiotics, have shown to effect behavioural change when they actively engage clinicians.

In keeping with HIQA’s standards for the prevention and control of healthcare associated infections this initiative implemented an ASP in one Public Dental Service.

## Aims & Objectives

**Aim**

- Reduce the number of antibiotics prescribed and ensure that those antibiotics that are prescribed are in line with best practice guidelines.

**Objectives**

- Introduce best practice guidelines (by Dec 2014).
- Design and introduce an antibiotic ledger to record antibiotic type, dosage and justification (by Dec 2014).
- All staff to have attended education sessions (by Dec 2014).
- Reduce the number of antibiotics prescribed by clinicians (by March 2015).

## Methodology

- The factors which influence the prescribing patterns of clinicians are complex. Guideline implementation, even when combined with education, can be ineffective in promoting behavioural change.
- An evidence based, multifaceted ASP was implemented which included guideline introduction, education sessions, an antibiotic ledger, clinical audit and individualised feedback to clinicians.
- The HSE Change Model was used as a framework for the planning and implementation of the ASP.

### Figure 1: HSE Change Model

- Base line measures showed wide variance in prescription rates between dentists with similar case loads, indicating potential-clinical risk and creating an urgency for change.
- The initiation and planning stages identified the importance of positive leadership, good communication and building coalitions to address resistance and engage staff.
- During the implementation and mainstreaming stages changes were monitored and staff were encouraged and supported to reinforce change and ensure further improvements.
- Tactics to influence behavioural change
  - Education sessions were lead by senior clinicians to optimise the influence they might have on junior colleagues.
  - Presentation of results of base line measures highlighted the comparative prescribing practices of their peers.
  - Continuous feedback enabled access to instantaneous data, which tracked progress.

## Evaluation

- A measureable reduction in the number of antibiotics prescribed over the nine month period. Figure 2: % of Emergency Patients Prescribed an Antibiotic
- Each individual dentist also reduced their prescription rate.

### Figure 2: Individual prescribing rates pre and post intervention

<table>
<thead>
<tr>
<th>Dentists</th>
<th>% of Emergency Patients Prescribed an Antibiotic</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Pre: 10%, Post: 5%</td>
</tr>
<tr>
<td>B</td>
<td>Pre: 12%, Post: 7%</td>
</tr>
<tr>
<td>C</td>
<td>Pre: 14%, Post: 9%</td>
</tr>
<tr>
<td>D</td>
<td>Pre: 16%, Post: 11%</td>
</tr>
<tr>
<td>E</td>
<td>Pre: 18%, Post: 10%</td>
</tr>
<tr>
<td>F</td>
<td>Pre: 20%, Post: 12%</td>
</tr>
<tr>
<td>G</td>
<td>Pre: 22%, Post: 14%</td>
</tr>
<tr>
<td>H</td>
<td>Pre: 24%, Post: 16%</td>
</tr>
<tr>
<td>I</td>
<td>Pre: 26%, Post: 18%</td>
</tr>
<tr>
<td>J</td>
<td>Pre: 28%, Post: 20%</td>
</tr>
<tr>
<td>K</td>
<td>Pre: 30%, Post: 22%</td>
</tr>
<tr>
<td>L</td>
<td>Pre: 32%, Post: 24%</td>
</tr>
<tr>
<td>M</td>
<td>Pre: 34%, Post: 26%</td>
</tr>
<tr>
<td>N</td>
<td>Pre: 36%, Post: 28%</td>
</tr>
<tr>
<td>O</td>
<td>Pre: 38%, Post: 30%</td>
</tr>
</tbody>
</table>

The audit results provided evidence of guideline adherence relating to antibiotic choice but suggested the need for improvement in prescription justification and dosage.

## Organisational Impact

- The evaluation showed Behavioural change in the dentists’ prescribing patterns however there was a variance in how effective the change impacted individuals.
- Reduced risk of adverse outcomes for patients due to reduction in unnecessary antibiotics.
- Fulfillment of governance obligations for the monitoring and auditing of antibiotic prescribing.

## Conclusion

An evidence based stewardship program which actively engages clinicians, continuously monitoring progress can effectively change the prescribing practices of clinicians thus contributing to the battle against antibiotic resistance.