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[redacted]

FRCEM QIP, Spring 2017

A Quality Improvement Project to reduce the referral rates of paediatric patients to plastic surgery for closure of simple wounds under general anaesthetic.

Executive Summary

A Quality Improvement Project was undertaken at a District General Hospital to address the unnecessary referral of paediatric patients to plastic surgery for the closure of simple wounds, solely due to the perceived intolerance of the procedure.

A multi-disciplinary team implemented a topical local anaesthetic (LAT gel) as a solution using 'The Model for Improvement' change methodology and Plan-Do-Study-Act cycles.

A reduction in the total number of patients referred to plastic surgery was used as a simple metric to demonstrate the effectiveness of the change. The change was successful and a reduction in referrals of 50% in 4 months was achieved.

Word Count: 5623

(Excluding contents, tables, figures and appendices)

I declare that this Quality Improvement Project is my own work and that I have correctly acknowledged the work of others.

Candidate Signature: [redacted]

Trainer Signature: [redacted]

Contents

Abstract

Title: A Quality Improvement Project to reduce the referral rates of paediatric patients to plastic surgery for closure of simple wounds under general anaesthetic.

Background

A quality improvement project was undertaken at a District General Hospital to address the unnecessary referral of paediatric patients to plastic surgery for closure of simple wounds, under general anaesthetic, solely due to the perceived intolerance of the procedure.

Methods

A multi-disciplinary team implemented a topical local anaesthetic (LAT gel) as a solution using 'The Model for Improvement' change methodology and Plan-Do-Study-Act cycles. A reduction in referrals was used as a simple metric to demonstrate the effectiveness of the change with the SMART Aim of preventing 50% of paediatric (aged 0-16 years) referrals within 4 months

Results

The target aim was met and 50% of specialist referrals were prevented within 4 months. Increasing to 55% at 12 months.

Conclusions

LAT gel is a safe, effective and sustainable method of reducing referrals for non-complex paediatric wound closure. Now, more than 12 months from its implementation, LAT gel is still in use and its availability and guideline are part of the rolling teaching programme for staff.

Topic Identification

Miss S is a 4-year-old girl who presented to the Emergency Department with a leg laceration she had sustained when she fell onto a toy at nursery. Her wound was approximately 4cm on the lateral aspect of her thigh. It was deep to subcutaneous tissue but did not involve underlying muscle or deeper structures and it required closure with sutures. She was seen by an Emergency Nurse Practitioner in the minor injuries unit. I became involved when asked to prescribe some antibiotics for Miss S to take home. She was being referred to Plastic Surgery to have her wound closed the following day in clinic; This would likely be under a general anaesthetic. As warranted by good practice I spoke briefly to her parents regarding her allergies etc. who understandably were both a little anxious and frustrated. Frustrated at having waited several hours to be seen only to be told we needed to refer for closure and anxious with a wait until tomorrow for the wound to be closed and a general anaesthetic for their 4-year-old. They clearly wanted some clarification that this was the only option open to them, which currently it was.

Introduction & Background

The [redacted] is a medium sized district general hospital (DGH) [redacted], an area with a relatively low socioeconomic status. The [redacted] has a new Emergency care centre opened in 2015 which sees approximately 90,000 patients per year in its Emergency Department (ED) of which approximately 24% are paediatric (21,600).

The ED consists of 'Resus', 'Majors' and 'Minors' areas, an out of hours GP and a Paediatric ED. The 'Resus' and 'Majors' areas are staffed by a team of 7 Emergency Medicine (EM) Consultants plus training and non -training 'Middle Grade' and 'Junior' tiers. Predominantly adult patients are seen in these areas but obviously very unwell paediatric patients are also seen in 'Resus'.

The ‘Minors’ department sees both adult and paediatric minor injuries and is predominantly staffed by Emergency Nurse Practitioners (ENPs) who have access to Middle grade and Consultant advice from the main department if requested. The out of hours General Practitioner (GP) service sees mainly minor illness. The Paediatric ED is under the dual care of the EM and Paediatric teams, with the Paediatric team seeing medical patients and the EM team seeing the more serious paediatric injuries within the Paediatric ED or ‘Minors’ areas.

Lacerations are a common paediatric problem presenting to the ED and the case of ‘Miss S’ highlighted to me a potential area of improvement in the quality of care and the patient experience being delivered to these patients and their parents at the [redacted] I felt that there must be a way to reduce speciality referrals for wound closure that do not need a speciality repair. Talking informally to colleagues, most are referred simply because of a perceived intolerance to the local anaesthetic injection required based, for the most part, on the age of the patient. A speciality repair is necessary for the repair of deeper structures e.g. muscles, tendons, nerves or if a fracture is present, if a wound crosses the vermillion border of the lip, involves mucous membranes or contains a deeply embedded foreign body.

Referrals for wound closure are traditionally made to plastic surgery but the [redacted] being a DGH, does not have all specialities resident at the hospital and for plastic surgery expertise it is necessary to refer to the Royal Victoria Infirmary (RVI) in Newcastle, north of the River Tyne. Referral is normally for closure under general anaesthetic (GA), carrying with it additional risks, inconvenience and costs for both parent and child.

Initially having discussed my concerns with several of my colleagues and listened to their experiences of the same, I decided to speak to the Paediatric EM (PEM) lead [redacted]. He not only agreed with me but had himself highlighted it as an area for improvement. However, because of other work commitments and priorities he had not yet had time to consider it fully.

The Institute of Medicine (IOM) defines quality care in terms of six quality domains. Its definition of quality care is safe, effective, patient-centred, timely, efficient and equitable. [1] The IOM states, 'A health care system that achieves major gains in these six areas would be far better at meeting patient needs.' (p 3) Referral for such a simple procedure under GA, I feel impacts negatively on most of these quality domains:

- ***Safe***
  - General anaesthetics though generally very safe are not without risk. [2]
  - Potentially there is also an increased infection risk from delayed closure of the wound. Antibiotics are often given, but there is no evidence to my knowledge that "prophylactic" antibiotics reduce infection rates in such patients.
  - Unnecessary antibiotics can themselves pose a risk as they potentially can cause adverse reactions and often have side effects.
- ***Efficient***
  - There are cost implications for the National Health Service (NHS) in needing to see another specialist.
  - Cost of closure via a GA in terms of staff/equipment/beds and theatre time.
- ***Timely***
  - Delayed closure the following day at another hospital.
- ***Patient cantered***
  - Referral impacts negatively on the patient experience. It reduces confidence in the capability of the referring department and causes frustration and anxiety for both parent and child at the delay and the need for a GA.

- It has cost implications for both the patient and their family. In terms of:
    - Actual costs e.g. travel and parking.
    - Time costs e.g. parents having to juggle their busy 'day to day' activities such as work and family commitments to return to the hospital.
    - Children potentially must miss (more) school.

Analysis of the problem

Initially I put together a small stakeholder group which consisted of:

- [redacted] as the departments PEM lead who fulfilled the roles of both clinical lead and technical expertise.
- I was the day to day leader of the project.
- [redacted], a Foundation Year 2 doctor with a paediatric and EM interest.

During the analysis of the problem it became apparent that pharmacy was an important stakeholder group I hadn't considered initially, so I invited [redacted], the ED clinical pharmacist to join the group as their representative later in the process.

I needed to gather evidence around the problem. There had not been any complaints or incident reports highlighting it as an issue so with the clinical leads permission, and after registering the project with the audit department, I decided to conduct an audit. The aim of the audit was to look at current practice for the management of paediatric wounds at the [redacted] to gauge the urgency of the problem.

[redacted] collected data on the management of 100 paediatric wounds between January and February 2015. She looked at the documentation of wounds and our management compared to a

National Institute of Health and Clinical Excellence (NICE) Clinical Knowledge Summary.
This recommends that most wounds less than 5cm can be closed with steri-strips or tissue adhesive as they give as good a cosmetic result as sutures if the edges can be easily opposed without any dead space. However, some lacerations less than 5cm still require suturing because of their location, size or depth. [3]

The audit found that out of 100 patients:

- 84 (84%) patients had their wounds closed in the department with glue, steri-strips, staples or sutures
- 16 (16%) patients were referred to plastic surgery at the RVI.
    - 7 (7%) of these needed a specialist repair.
    - 9 (9%) did not have an indication for specialist repair documented in the notes
        - None had an attempted closure in the department.
        - The mean age of these patients was 2.66 years with a range of 1 – 8 years.

After this audit, I decided that my SMART Aim for the project was to reduce local paediatric referrals, (children aged 0-16 years) for non-specialist repair by 50% within four months. I decided on a percentage rather than an absolute figure to offset the natural variation in the number of presentations to the ED over a given time.

With the technical expertise of the process from the clinical lead and me I mapped the patient journey (See figure 1). I also used Ishikawa and Driver diagrams to break down the problem and identified factors in the process that could be targeted as potential areas of improvement or solutions to help me achieve my aim (See figures 2 & 3).

Figure 1 - Process mapping flow diagram to show the paediatric patients journey when presenting with a wound at the [redacted] pre QIP

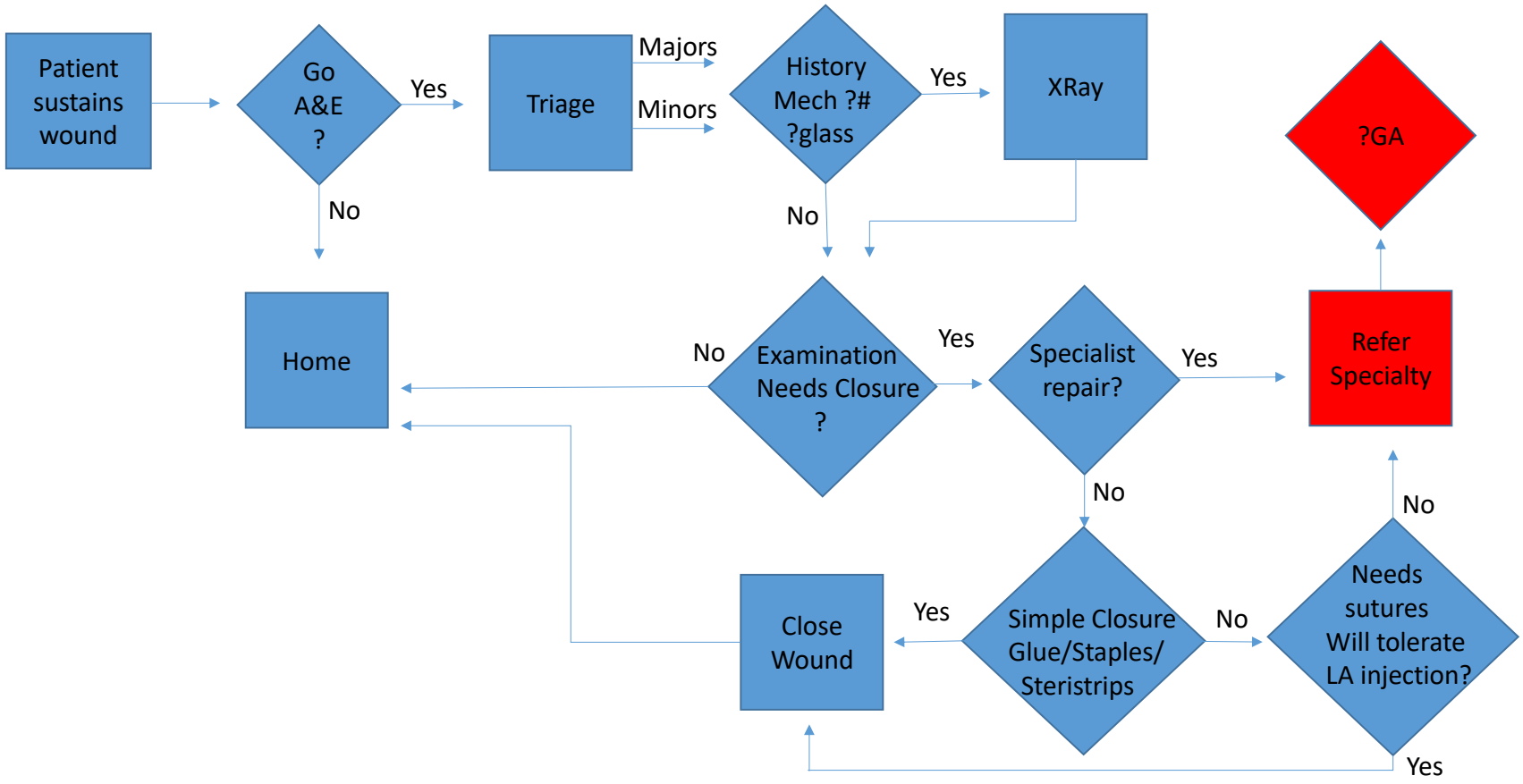


Figure 2 – Driver Diagram

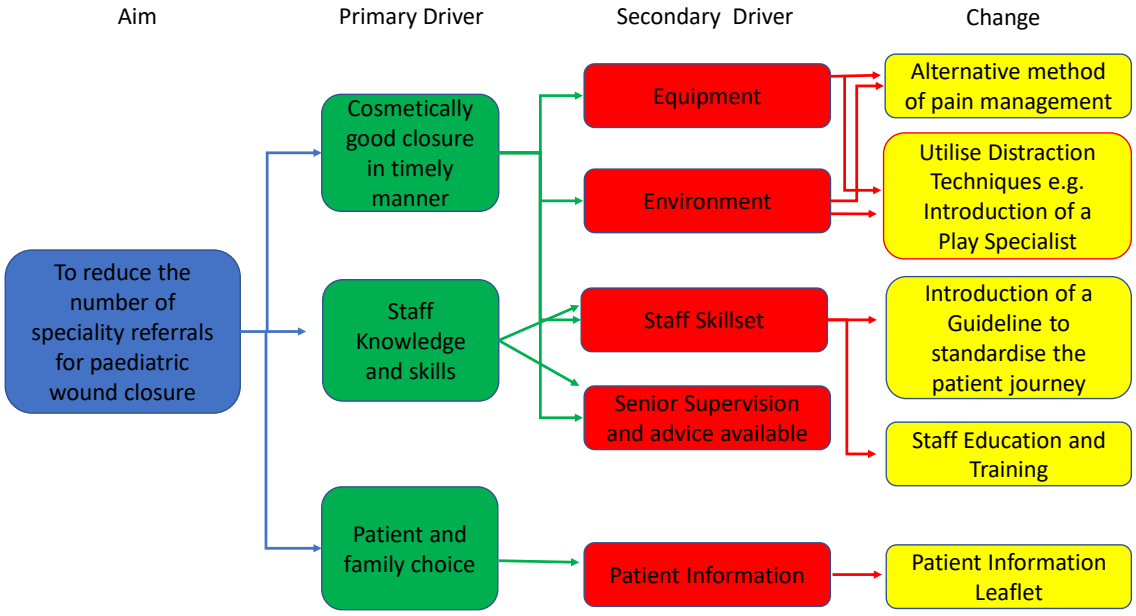
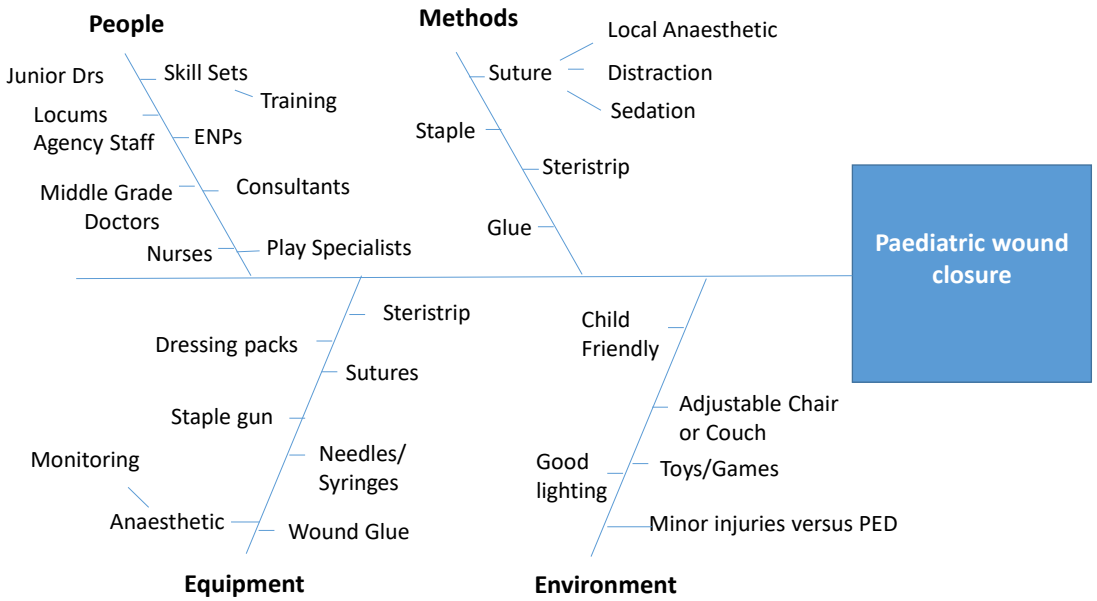


Figure 3 – Ishikawa Cause and Effect diagram



Alongside this to investigate the current knowledge base, I decided to search the available literature focusing on any analysis of the issue already conducted and for potential solutions to the problem. I wanted to include both scientific and non-scientific literature in my review. I conducted a formal search of the scientific literature using Medline, Embase and CIHNAL and I enlisted the help of the [redacted] librarians to ensure my search was accurate and fully inclusive. I also searched using google and NHS evidence. A brief overview of the contents of the paper was gleaned from the abstract and papers were disregarded if they bore no relevance to the project. I hand searched through the references of all the papers I read to identify any relevant papers that had been missed. A summary and appraisal of the evidence I obtained is tabulated in Appendix B.

As a stakeholder group, we discussed any solutions that we had come across in other hospitals that we had worked in. I contacted the regional hospitals and several of them including Sunderland Royal Hospital, The RVI, James Cook University Hospital and North Teesside Hospital were already using topical local anaesthetics for the closure of wounds and sent me their protocols. I also contacted the RVI plastics department and they confirmed that they do not yet use topical local anaesthetic and so a patient who could not tolerate infiltrated anaesthetic would require a GA.

In terms of costing a referral, one article I read cited that the estimated cumulative cost to the NHS of thirty minutes of general anaesthesia for a child, averages at £229 [4] I also contacted the finance department at the RVI for a current quote on how much a paediatric plastic surgery procedure under GA would cost. Though this is obviously variable depending on the complexity of the procedure, they quoted upwards of £850, which was the suturing of a small lip laceration.

The main issue for speciality referrals, identified both locally and in the literature, is the perceived intolerance of a local anaesthetic injection and/or the procedure of suturing itself. [5-9] The problem analysis highlighted three solutions to the problem:

1) Play specialists and distraction techniques
2) Sedation in the ED for e.g. with Ketamine
3) Local anaesthetic topical gels

Discussing the alternatives, the stakeholder group decided on the last option as the proposed change. Considering the other two options in turn our reasons were:

1) Play Specialists and distraction techniques

As the department, does not employ any play specialists currently, this would obviously involve the hiring of staff which was felt to be outside the scope of this project. In the literature, this method tends to be used in conjunction with other methods rather than alone. [5,10]

2) Ketamine Sedation

There is a lot of evidence in the literature regarding Ketamine sedation for children which suggests it is safe to use. NICE and the Royal College of Emergency Medicine have produced evidence based guidelines for its use. [11,12] However, it is a very resource heavy option. It requires a high level of monitoring of the patient both during the procedure and for some time afterwards and it requires at least three trained staff members. There is obviously a requirement for them to upkeep their skills, calling into question its sustainability at the [redacted] with such small patient numbers. [11-13]

The guidelines [11-12] suggest that children should be fasted which is unlikely to be the case in most patients and therefore urgency of the procedure would have to be weighed up against potential complications. Sutures in a simple wound are unlikely to warrant an unfasted sedation. Locally none of the regions ED's sedate with ketamine to facilitate wound closure currently.

Ketamine does have some significant and potentially distressing common side effects such as agitation (20%), rash (10%) and hyper-salivation (10%). Less commonly vomiting (5-10%) and in very rare instances laryngospasm (0.3%). [11-14] RCEM's first recommendation on the use of Ketamine sedation suggests exploring all other options first. Therefore, we decided that the simplest solution was to find an alternative way of anaesthetising wounds other than infiltration and a topical local anaesthetic was the proposed change.

We then discussed the different options in this group. There are several types of topical local anaesthetic product quoted in the literature. The main difference between them being whether they are cocaine or non-cocaine based. They do not appear to differ in efficacy [15] but cocaine containing gels have a higher incidence of side effects and obviously are more problematic to store and prescribe as they contain a controlled drug. [7,15]

The main non-cocaine containing gel is Lignocaine Adrenaline Tetracaine (LAT) gel. There are products containing different strengths of the various ingredients in the literature but Lignocaine 4% Adrenaline 0.1% and tetracaine 0.5% is most commonly in use both locally and in the literature so it was the obvious choice. [5-7] It has been shown to be comparable in efficacy to infiltrated local anaesthetic in several Randomised Control Trials, is painless and has very few side effects. It also has the added benefit of not causing tissue distortion through anaesthetic infiltration into the skin. [16,17,18]

It does have some drawbacks however:

- It is unsuitable for lacerations of the mucous membranes because of increased absorption so cannot be used intraorally.
- It is unsuitable for use on digits or extremities such as the pinna or penis as there is a theoretical risk of ischemia.
- It takes approximately 30 minutes to work, so longer than infiltrated lignocaine.
- It has a shorter duration of action at 20 minutes than infiltrated lignocaine. [5-7]

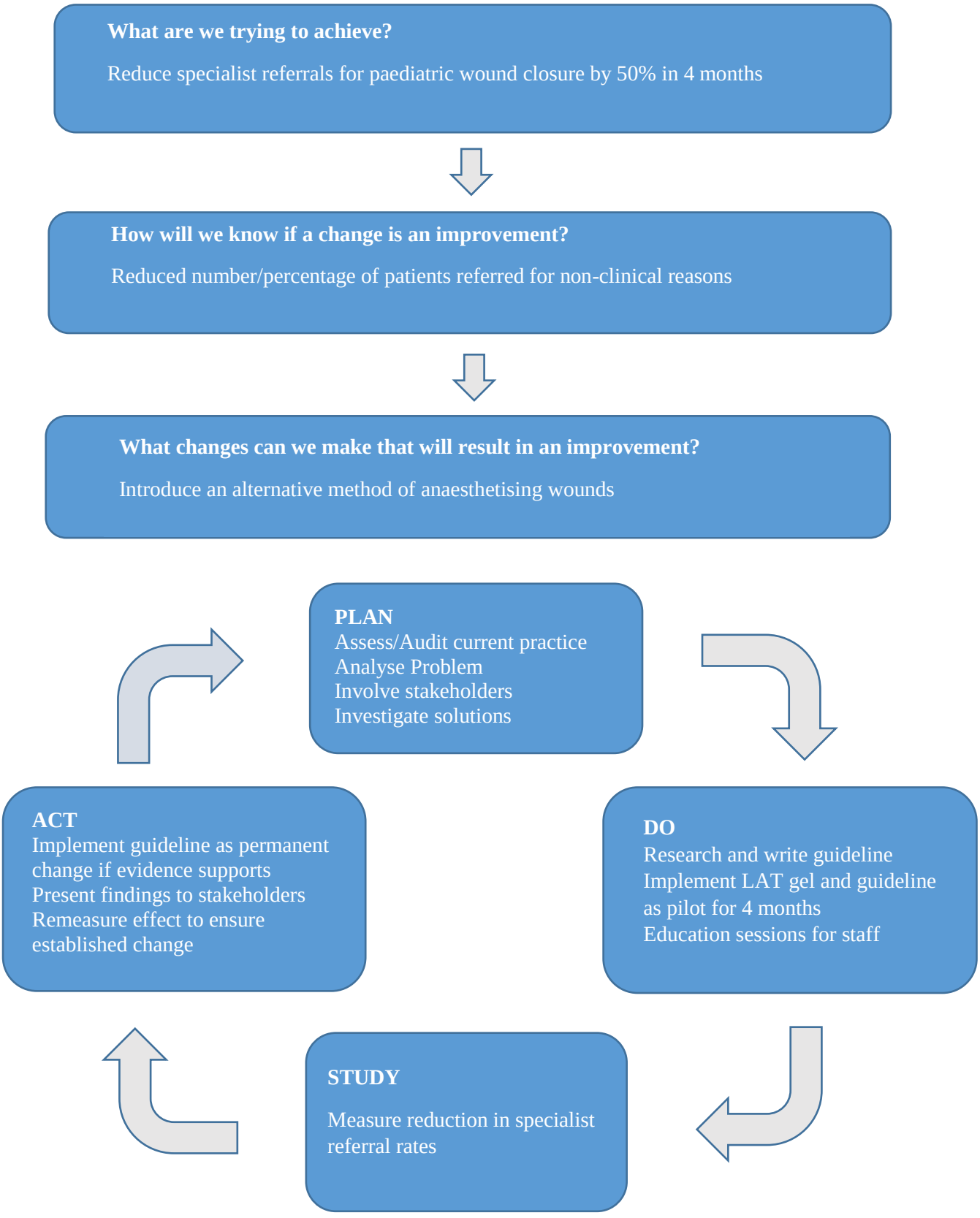
Methods

The envisaged change from the introduction of LAT gel was that all clinical staff would utilise it to facilitate suturing and referral rates would decrease. In terms of a formal improvement tool, 'The Model for Improvement' using Plan-Do-Study-Act (PDSA) cycles was adopted, as cited by the institute of healthcare improvement, 2009. [19] It was chosen as it is a simple model and gives quick results, allowing small changes to be made and continually assessed for improvement. [20] (See figure 4 for the initial PDSA cycle)

[redacted] was tasked with the pricing and procurement of LAT gel. He obtained it from a company called Torbay pharmaceuticals at a price of £14.40 per unit. A unit is a 3ml vial. One drawback of the product is its procurement. As a special, from a single supplier, its availability cannot always be guaranteed.

I researched and wrote the guideline on LAT Gel use and with [redacted]' expertise applied for its introduction onto the hospitals formulary. This required an application to the [redacted] Medicines Management Committee (MMC) and a formal presentation at their July meeting. Our application was successful.

Figure 4 – Plan-Do-Study-Act Cycle



In terms of measurement it was felt that an ‘outcome’ measure was most appropriate, as ‘outcome’ measures are the ‘voice of the patient’ rather than a ‘process’ measure. The metric chosen was ‘number of patients referred’ for a simple wound closure i.e. for perceived intolerance of procedure rather than for specialist repair.

We decided that because the problem chosen was relatively ‘low output’ (the initial audit showed only 9 patients referred in a two-month period) it would not be feasible to look at data weekly or monthly as the numbers of patients would be too low. So, the decision was made to do ‘audits’ of the data over longer periods to assess the effects of our changes.

The team consensus was to run a ‘pilot’ and ascertain at the 4-month stage if we had achieved our SMART Aim. If we had sufficient evidence to support this being a long-term change then we would continue and reassess at a later point to ensure the change was sustained.

A timeline for the project can be seen in Figure 5 in the form of a Gantt diagram, highlighting the timescale of various tasks and pinpointing milestones within the project.

Change Implementation

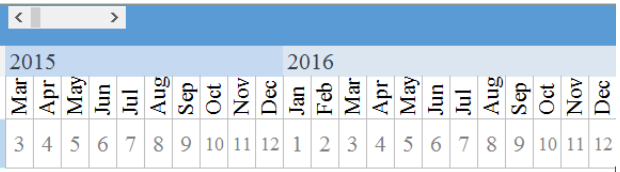
I widely advertised the availability of LAT gel, the guideline on its use and the proposed start date of the pilot which was Sept 2015 to all ED and paediatric staff members by several methods:

Figure 5 – Gantt Diagram of project timeline

Reduction of Specialist Referrals for Paediatric Wound Closure

Project Lead: [redacted]

WBS	Task Name	Resource Names	Start	Finish	Duration	Percent Complete
M	Intial meeting with Clinical Lead	JW/PE	Mon 02-Mar-15	Mon 02-Mar-15	1	-
1	Analysis of the problem	JW/MT/MM/MT	Mon 02-Mar-15	Fri 01-May-15	45	100%
2	Baseline Audit	MM	Wed 18-Mar-15	Wed 15-Apr-15	21	100%
3	Guideline Development	JW	Fri 01-May-15	Tue 23-Jun-15	38	100%
M	Pharmacy Stakeholder Meeting - prior to MMC	JW/PE/MT	Tue 23-Jun-15	Tue 23-Jun-15	1	-
M	Medicines Management Commitee Meeting	JW/PE/MT	Wed 08-Jul-15	Wed 08-Jul-15	1	-
M	LAT gel application approved	MMC	Tue 14-Jul-15	Tue 14-Jul-15	1	-
4	Advertisement of change implementation	JW/PE	Wed 15-Jul-15	Tue 01-Sep-15	35	100%
M	Guideline Published Online		Wed 05-Aug-15	Wed 05-Aug-15	1	-
M	LAT Gel available		Tue 01-Sep-15	Tue 01-Sep-15	1	-
5	Maternity Leave		Mon 07-Sep-15	Fri 01-Jul-16	215	100%
6	4 month audit data	JW	Fri 01/Jan/16	Sun 28/Feb/16	41	100%
7	Targetted ENP/SHO teaching sessions	JW/PE	Mon 01/Aug/16	Thu 01/Sep/16	24	100%
8	12 month audit data	JW	Thu 01/Sep/16	Mon 31/Oct/16	43	100%
9	Literature appraisal - reviewed periodically	JW	Sun 08-Mar-15	Thu 01-Dec-16	454	100%
10	QIP write up	JW	Mon 05/Sep/16	Fri 30/Dec/16	85	99%



[redacted]

- Word of mouth
- I sent emails out to consultant, ENP and medical staff and to senior nursing staff for them to cascade down to other nursing staff. Nurses may not use LAT gel themselves but would likely be administering it and could highlight its availability for example to locum staff or rotating doctors to initiate its use.
- The guideline was also published on the intranet in the departments clinical handbook and on the pharmacy medicines page.
- Formal teaching sessions.

A potential issue arose which may have delayed our start date when Torbay Pharmaceuticals advised us of a possible manufacturing delay, but a supply arrived in time so there were no issues associated with its implementation.

Stakeholder Engagement and Teamworking

Throughout the project, I have engaged with the stakeholders on a regular basis especially in the planning and implementation stages. I had regular meetings and informal contact with [redacted], as PEM lead, my educational supervisor and clinical lead for the project.

I invited a pharmacy representative, [redacted], into the stakeholder group during the planning and analysis stage. The main reason being that pharmacists are experts in the composition, procurement and use of medicines. LAT gel is an un-licenced medication therefore there are certain restrictions on its use and it must be used on a 'named patient' basis and records kept. Regarding its manufacture, it is a 'special' i.e. made in small batches at a limited number of sites so procurement can be difficult. His expertise proved invaluable in sourcing and introducing this product.

There were formal planned meetings with [redacted] and the MMC. Minutes of which can be found in Appendix C. [redacted] and I worked together to formulate the case for LAT gel to present to the MMC as he had prior knowledge of the information they required and the likely questions they would ask. We also had regular group email contact as issues arose such as the potential delay in the initial stock arriving.

Suggestions from stakeholders were welcomed at any stage. One suggestion to simplify the process was from [redacted]. He suggested that the paper records we were keeping were unnecessary as we have a fully automated 'Omnicell' drug storage system, where patient details must be entered to extract the medication. Records of LAT gel use is now paperless, so at no risk of being misplaced.

Results

The audit tool from the initial audit of current practice was used to ensure consistency.

At the four month stage a re-audit of a further 100 patients that attended in Jan-Feb 2016 demonstrated that:

- 92 (92%) of patients had their wounds closed in the department
    - 6 (6%) with LAT gel and sutures.
        - The mean age of these patients was 6.8 with a range from 2-9 years.
        - Sites were ankle, hand, forehead, foot and back.
        - None of the patients required a 'top up' of infiltrated local anaesthetic
        - The users were all of registrar (5) or consultant level (1)
- 8 (8%) of patients were referred on to speciality, 7 to plastic surgery and 1 to maxillofacial surgery at the RVI.

- 2 (2%) were appropriate referrals. One was a possible digital nerve injury referred to plastic surgery. The other was a tongue wound referred to maxillofacial surgery. LAT gel is contraindicated for use on the tongue

- 6 (6%) did not need a specialist repair from the notes documented.
    - The mean age of these patients was 2.9 with a range from 1-7.
    - None of them had an attempted closure documented in the department.
    - The sites of injury were all on the face or forehead.
    - All the wounds were less than 4cm.
    - 5 referrals were from ENP's and one was from a Registrar.

My SMART Aim for the project was 'to reduce paediatric referrals aged 0-16 years, for non-specialist repair by 50% within four months'. If LAT gel had not been available, then a further 6 patients would have been referred making 12 in total or 12%. As only 6 patients were referred the referral rate was reduced by 50% to 6% meaning that my SMART Aim was achieved. Therefore, the pilot was successful and LAT gel was adopted as a permanent change as it demonstrated improvement.

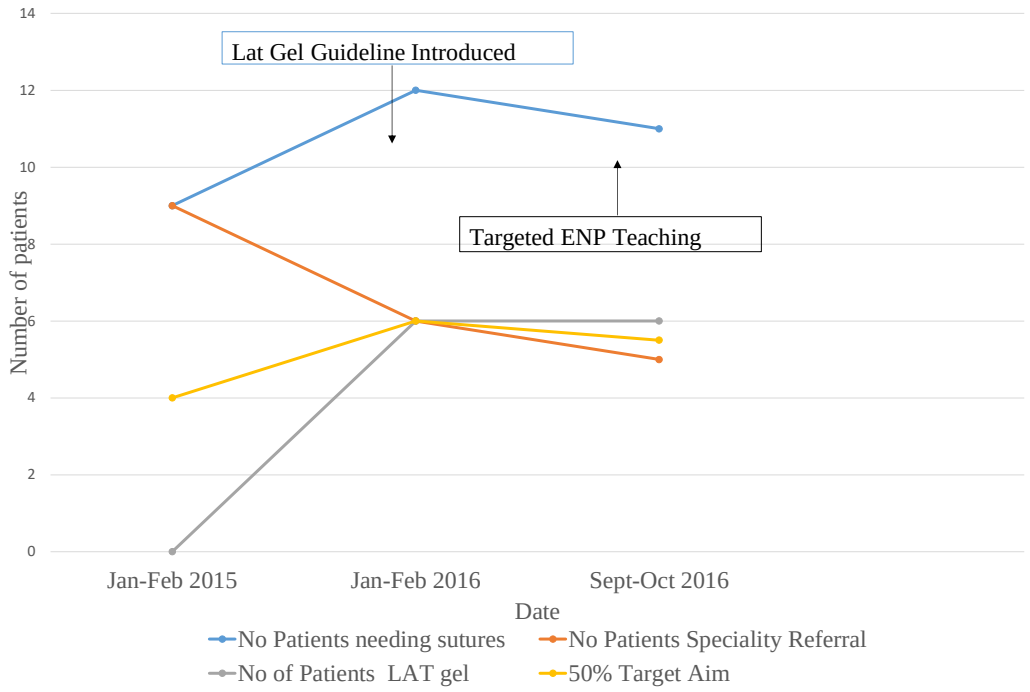
At the 12 month stage a re-audit of a further 100 patients who attended in Oct-Nov 2016 demonstrated that:

- 90 (90%) of patients had their wounds closed in the department
    - 6 (6%) with sutures and LAT gel.
    - The mean age of these patients was 11.3 with a range from 9-14 years
    - The sites of use were face, hand, shin and knee.
    - None of the patients required a 'top up' of infiltrated local anaesthetic
    - Notably LAT gel had been used by 2 ENP's this time and a foundation doctor. It was also used in one patient by a Registrar after a referral on from an ENP.

- 10 (10%) Patients were referred to speciality
    - 5 (5%) were appropriate referrals. One to orthopaedic surgery for removal of a foreign body and four to plastic surgery for specialist repair of hand injuries.
    - 5 (5%) did not need a specialist repair from the documented notes
        - The mean age of these patients was 2.8 years with a range from 1-4 years
        - None of them had an attempted closure documented in the department
        - The sites of injury were all on the face.
        - All the wounds were 4cm or less in length.
        - The referrers were 2 GPs, an ENP, a Registrar and a Consultant.

If LAT gel had not been available, then a further 6 patients would have been referred making a total of 11 referrals or 11%. As LAT gel was available only 5 patients or 5% were referred, a reduction of 55%. Demonstrating a sustained improvement.

Figure 6- Run Chart of Audit data



There was no evidence of any unwanted consequences, adverse reactions or complaints reported by staff or documented in the notes for any of the patients who received LAT gel.

Iterative process

A Quality Improvement Project should show sustained improvement over time. The audit process has been completed twice since the introduction of LAT gel and demonstrated a sustained improvement.

In the first audit my SMART Aim was achieved but it highlighted that ENPs and Junior Doctors were underutilising LAT gel and indeed were the practitioners making most of the referrals. So, I completed another PDSA cycle with the change being a much more targeted teaching programme aimed specifically at the ENPs and Junior Doctors. The 12-month audit not only demonstrated a sustained improvement but an improvement in uptake of use by these groups.

The guideline is now part of the rolling teaching programme for both ENP's, Junior doctors and Registrars which is necessary for sustainability because of the turnover of new doctors within the department.

Discussion

The introduction of LAT gel has been shown to improve the 'patient experience' by halving the number of patients being referred to plastic surgery for simple wound closure. These results mirror a service review in a Limerick hospital in 2008 where the introduction of LAT gel reduced referral for speciality review from 19.4% to 9.7%. [5]

LAT gel has financial advantages over speciality referral too. A vial of LAT costs £14.40 (with two vials being the maximum dose in a child) compared to the minimum cost of £850 for a simple procedure under GA by plastic surgery.

Limitations of the methodology used to demonstrate this improvement are:

- The relatively low patient numbers made continuous data collection unworkable.
- For the metric used to measure improvement, an assumption was made that for all patients were LAT gel was used, a speciality referral would have been made prior to its introduction.
- Decisions regarding referral are dependent on individual practitioners and as such are subjective and open to bias. A way to minimise this may be to develop a guideline outlining exact referral criteria.

I think that the implemented improvement is easily sustainable. Barring supply issues, pharmacy will continue to procure and stock LAT gel, the guideline is available on the intranet and its availability and use are part of the rolling teaching programme for all staff.

Limitations of the implemented change are:

- There is a maximum wound length that can be anaesthetised because of dosage considerations.
- There are restrictions on the areas it can be used because of theoretical concerns regarding tissue ischemia. Its use on digits and extremities such as the pinna and penis is relatively contraindicated. Though the evidence to support or refute this

theory is limited, this restriction is included in the guideline. Although I did find one paper that concluded it was safe for use on digits. [21]

- Its use does require co-operation from the child, as with all paediatric interactions. Co-operation may be improved by using distraction methods concurrently though these have not been investigated within this project as they are rarely documented.
- Some practitioners, given cosmetic considerations, may not be confident in their skills to suture for example facial wounds in young children even if made possible using LAT gel.

Therefore, although the improvement has proved to be sustainable it may not be possible to improve referral rates any further.

There have been no problems, complaints or adverse reactions attributable to its introduction, highlighted by either staff or patients. One issue highlighted in the literature however, is that a 'top up' of infiltrated local anaesthetic is sometimes required for a pain free procedure. Though less painful than an injection prior to its application this does somewhat negate one of the main advantages of LAT gel which is not having to use a needle. However, here were no documented cases of this being required in any of the patients in this project.

I feel that future work could be done to quantify any balancing outcomes such as prolonged length of stay or 'breaches' because of its use as onset of anaesthesia takes approximately 30 mins. If this is identified as a problem a study has been done to show that proactively applying LAT gel at triage, reduces the duration of the visit significantly [22] As well as developing a patient information leaflet on LAT gel to support patient choice through education.

Reflections

I, along with my stakeholder group, introduced a simple and cheap solution to a patient centred problem that I had identified. Prior to its implementation, the 'patient journey' was more stressful for both the patient and the patient's family and costlier to the NHS. Its implementation has improved patient and parent experience within the [redacted] ED.

Overall I have really enjoyed this project though I will readily admit I found aspects of it both challenging and frustrating. These aspects however are the parts I learnt the most from both personally about myself and professionally to take forward into my future career as an EM Consultant and hopefully future Quality Improvement Projects.

This project has required me to do a lot of reading and research into the concept of Quality Improvement itself and the tools that can be used to generate improvement. I for example enrolled with the 'Institute for Healthcare Improvement' and completed their module on 'How to improve with the model for improvement'. Although I felt I had engaged previously in projects to improve patient care e.g. in audit cycles, this project highlighted to me that in fact I knew very little of the formal process of 'Quality Improvement' or the evidence base underpinning it.

No significant hurdles were faced during the development and implementation process. I have found that staff have been open minded and supportive of changes and have engaged well with its use. Within the stakeholder group, the EM and Pharmacy representatives worked well together. I found [redacted], the departments pharmacist invaluable and I feel the project has improved relations between the two departments and opened the door to future collaborative projects. On reflection, I feel

I should have included representatives from the ENP's in the initial stakeholder group. This I think would have improved their engagement with the project earlier in the process.

As the project has evolved, whilst talking informally to some of the ENPs, it appears that their almost 'reflex 'response to refer paediatric wounds to plastic surgery if needing sutures has changed. I think the project has continued to build on relations between 'minor injuries' and the main department and now even if they are not confident in their ability to close a wound they feel more empowered to refer onto a registrar or consultant for closure with LAT gel as seen in one case in the 12-month audit.

One challenge has been the relative infrequency of the problem. Whilst paediatric wounds are a common occurrence most of them can be closed by simple measures i.e. wound adhesive or steri-strips and only relatively low numbers need suturing. I found this made frequent data collection impossible because of the low numbers involved. However, data collection is ongoing and future changes may be possible in response to this data as it is analysed.

During my write up I realised that, ideally, I should have included more than one metric to assess improvement through. I thought that patient/parent satisfaction in the form of a qualitative survey would be an excellent 'outcome' measure of demonstrating improved patient care as described by Lowe et al. [22] He found that provider performance was the strongest predictor of excellent parent satisfaction for paediatric wound repair rather than cosmetic appearance or even pain. However, when I contacted the hospitals information governance department I was told that under Caldicott guidance I would not able to survey parents retrospectively as consent needed to be gained in real time. The hospitals Caldicott guardian confirmed this. For me this was an important lesson I can carry through to future projects. However, I was disappointed I had not realised this earlier as I feel this aspect would have added impetus to the improvement demonstrated by this project and been a true marker of patient focused improvement had their comments been positive.

The main hurdle I have faced is a matter of the timing and hence the timescale of the project. Although the concept of Quality Improvement in EM is not new, the QIP aspect of the FRCEM examination is, so the methodology and tools used to power improvement through change are new to not only me as an EM trainee but also to our Trainers. As such the guidelines and requirements for the project have been developing slowly over the last 18 months which I have found challenging. I initiated the project as an ST5 in the spring of 2015 but I had just six months left at the unit, prior to a period of planned leave. I introduced the product guideline in September 2015 which coincided with me leaving training for a year's maternity leave. I have found juggling maternity leave, returning to work fulltime and overseeing the project very demanding and so the overall project length has been prolonged and the timescale between aspects of the project elongated.

In terms of sharing my findings with other trainees and units, the initial audit on wound management was presented at the regional Northern Paediatric Emergency Medicine Conference in 2016 and I will look to present my finished QIP at this year's conference.

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Appendix A

Guideline for the administration of Lignocaine, Adrenaline, tetracaine (LAT) gel for the management of Paediatric lacerations

Definition

LAT gel is a topical anaesthetic gel that is effective in anaesthetising superficial dermal wounds which require minor surgical repair, debridement or foreign body removal. It can be used in wounds that are less than 4cm long, do not involve digits, mucous membranes or other extremities i.e. pinna, penis, tip of nose.

Composition

Lignocaine 4%, Adrenaline 0.1%, Tetracaine 0.5%

Aim

To reduce the pain and anxiety felt by children undergoing minor surgical repair or removal of foreign body from wounds.

Process

- Staff should be trained in its application
- The wound should be selected for suitability – see exclusion criteria
- Prior to application wound should be cleaned gently to remove debris/clot to allow maximum penetration of gel
- Use 1ml of LAT gel per cm of wound up to a maximum of: 2ml for those aged 1-3 years
- Using a syringe apply half of gel to wound edges and the rest to wound.
- Cover wound with dressing and leave for 15-30 minutes.
- Test for anaesthetic efficacy before suturing - wound edges should blanch
- Wounds should be sutured within 20 minutes of removing the gel

- If pain persists a further 3mg/kg of 1% lignocaine can be infiltrated subcutaneously to wound.

Exclusion Criteria

- Wounds greater than 4cm
- Digits
- Extremities – e.g. pinna, tip of nose, penis
- Mucous membranes

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[redacted]

June 2015

Appendix B - Literature Summary and Appraisal

Date Author	Design	Population	Objective	Primary Outcome	Results	Conclusions	Strengths and Weaknesses
2004 White et al	Prospective case series	67 Children aged 5-18 UK ED	To determine the efficacy and safety of LAT gel on the repair of finger lacerations	LAT success or failure	53.7% successful anaesthesia Rising to 68.6% on dorsal lacerations No signs of digital ischemia in any patient	LAT gel safe and effective on finger lacerations It is most effective in dorsal lacerations	Weaknesses • Small study • Convenience sample • Pains score is subjective • Why excluded < 5 years- limits generalisability in normal ED paediatric population
2005 Ferguson, C & Loryman, Pryor 1990 Anderson 1990 Hegenberth 1990 Smith 1996	BestBETs Review 7 prospective RCT's 1980-1997 Prospective RCT Prospective RCT Prospective RCT Prospective RCT	 USA 158 children USA 151 <18 years USA 467 <18 years USA 240 >2 years	Anaesthesia efficacy of topical gels versus lignocaine infiltration	Anaesthetic efficacy via pain scores		Topical local anaesthetics have similar efficacy to lignocaine and are less painful. Ideal agent yet to be decided.	Weaknesses • Age of trial • Single centre • randomisation method open to bias • High dropout rate – bias • No raw data • Single centre • Not blinded

Kendall 1996 Ernst 1997 Smith 1997	Prospective RCT Prospective RCT Prospective RCT	UK 107 aged 3-16 years USA 66 patients > 5 years USA 71 patients >2 years					• Not blinded • Single centre • Small study • Small study • States blinded but isn't as lignocaine injected
2006 Loryman et al	Postal Survey	UK EDs	To determine the proportion of UK EDs that use modern pharmacological methods such as Ketamine sedation, topical anaesthetics or IN diamorphine.		70% replied Of these: 41% use top LA 55% IN diamorphine 27% ketamine	Approximately half UK departments use modern pharmacological methods of pain control	Weaknesses • Only 70% response rate could cause bias and affect accuracy if variables not distributed evenly through responders and non-responders
2010 O'Connor & Mullarky	Retrospective Review	Children 0-14 Urban Irish ED	To show that introduction of LAT gel would reduce speciality referrals	Reduction in referrals	Referral rate reduced from 19.4% to 9.7%	LAT gel introduction significantly reduced referrals	Weaknesses • Small numbers • Retrospective so possible bias Strengths • Equal distribution of confounding variables between pre-and post-LAT groups

2011 Eidelman et all	Cochrane systematic review of 39 RCTs	Adults and children in the ED	To compare the efficacy and safety of infiltrated LA with topical LA and the efficacy of different topical products	Anaesthetic efficacy via pain score	3 RCTs – equal effectiveness of LAT and TAC 4 RCTs – no difference in pain score between non-cocaine topical anaesthetic and infiltrated lignocaine	Topical anaesthetics are as effective as infiltrated lignocaine	Weaknesses • Heterogeneity of studies • Publication bias • Variability in patient age • Variability in pain assessment
2012 Anderson	BestBETs Review 2 prospective RCTs 1 meta-analysis (Eidelman above)	Children	Efficacy of topical LAT gel compared to TAC gel	Anaesthetic efficacy via pain score	Ernst 1995 No difference in pain score Schilling 1995 No difference in pain score	LAT gel is as efficacious as TAC	Weaknesses • Old study • Small sample size • Convenience sample • Pain score subjective Strengths • Power Calculation Performed • Double blinded Weaknesses • Old study • Pain score subjective Strengths • Blinded
2012 Lowe et al	Descriptive Observational Study	408 parents Urban ED USA	To define the elements of care that are important to parents during laceration repair to determine the predictors of	Parent satisfaction	Provider performance was 11.6	Provider performance comprising of communication, attitude, confidence and hygiene are	Weaknesses • Convenience sample • Subjective outcome measure • Single centre may limit generalisability

			excellent patient satisfaction			strongest predictors of satisfaction. Rather than pain or cosmetic appearance.	
2014 Lee et al	Prospective Randomised Control Trial	40 Adults and children aged between 1-70. Singapore ED	LAT gel compared to lignocaine infiltration for suturing minor lacerations.	Efficacy of analgesia and pain of anaesthetic using visual pain scale.	Mean pain score was 2.5 for both groups	LAT gel is as efficacious as Lignocaine Infiltration.	Weaknesses • Small sample • Single centre may limit external validity • Adult results may not be generalizable to UK paediatric patients • Not blinded because of obvious differences in anaesthesia therefore risk of bias
2015 Kidd et al	Retrospective service review	215 Children < 18 years	To stratify adverse events	Adverse reaction rate	9.8% had adverse event all minor	Supports ongoing use of ketamine sedation Acknowledges high resource requirements	Weaknesses • Single centre limits generalisability • Retrospective
2016 Belliolio et al	Systematic review and meta-analysis	Children < 18	To evaluate the incidence of adverse events in the ED	Adverse reaction rates	Vomiting most common s/e 5.5%	Serious adverse reactions rare	Strengths: • Large sample • Multicentre Weaknesses • variable measured outcomes • heterogeneity of studies

Other Evidence reviewed:

Author and Title	Type of Evidence	Summary
Addenbrookes, North Teesside and Sunderland Royal. LAT guidelines	Hospital Guidelines	LAT gel can be used on wounds at a dose of 0.5-1ml per cm. Max 4cm. Contra indicated in extremities and digits. 30 minutes' onset time.
O'Donnell et al. Emergency analgesia in the paediatric population. Part iii Non-pharmacological measures of pain relief and anxiolysis.	Review Article	Describes how pain affects children and how important environment is Describes non-pharmacological methods of pain alleviation including psychological, cutaneous and physical such as splintage.
S Maurice et al. Emergency analgesia in the paediatric population. Part ii Pharmacological methods of pain relief.	Review Article	Describes local anaesthetic topically EMLA/TAC, infiltrated and regional Describes analgesia
McNulty et al. Reducing the need for general anaesthesia in children: use of LAT gel in treating facial lacerations.	Technical Article	Describes LAT gels method of use Describes its advantages, disadvantages and cost
Wang, B et al. LAT gel, a powerful tool underused in the repair of paediatric lacerations.	Technical Article and Survey	Describes the use of LAT gel its method, efficacy & side effects. Describes its use within the EDs of the South West of England -only half of them (47%) stock LAT gel, a third (32%) stock TAC gel, with a fifth (21%) not stocking either.
NICE:CG112: Evidence based guideline on Paediatric sedation	National Guideline	Evidence based recommendations on how to perform ketamine sedation 2 trained professionals, monitoring requirements, non-fasted procedure depends on urgency. Outlines s/e profile.
RCEM: Guideline for ketamine sedation of children	Royal College EM Guideline	Evidence based recommendations on how to perform ketamine sedation 3 trained professionals, full monitoring in resus. Fasted if deep sedation, non-fasted need to weigh risks. Outlines side effects
Simon Carley. St Emlyns Emergency Medicine. 2011. *Please use less ketamine*. Can be found at: http://stemlynsblog.org/lately-its-lat-gel/	Blogs	Anecdotal blogs about increasing use of LAT gel for wound closure and decreasing use of procedural sedation.

Appendix C – Example Minutes of Stakeholder minutes

1) Pharmacy Stakeholder meeting 23rd June 2015

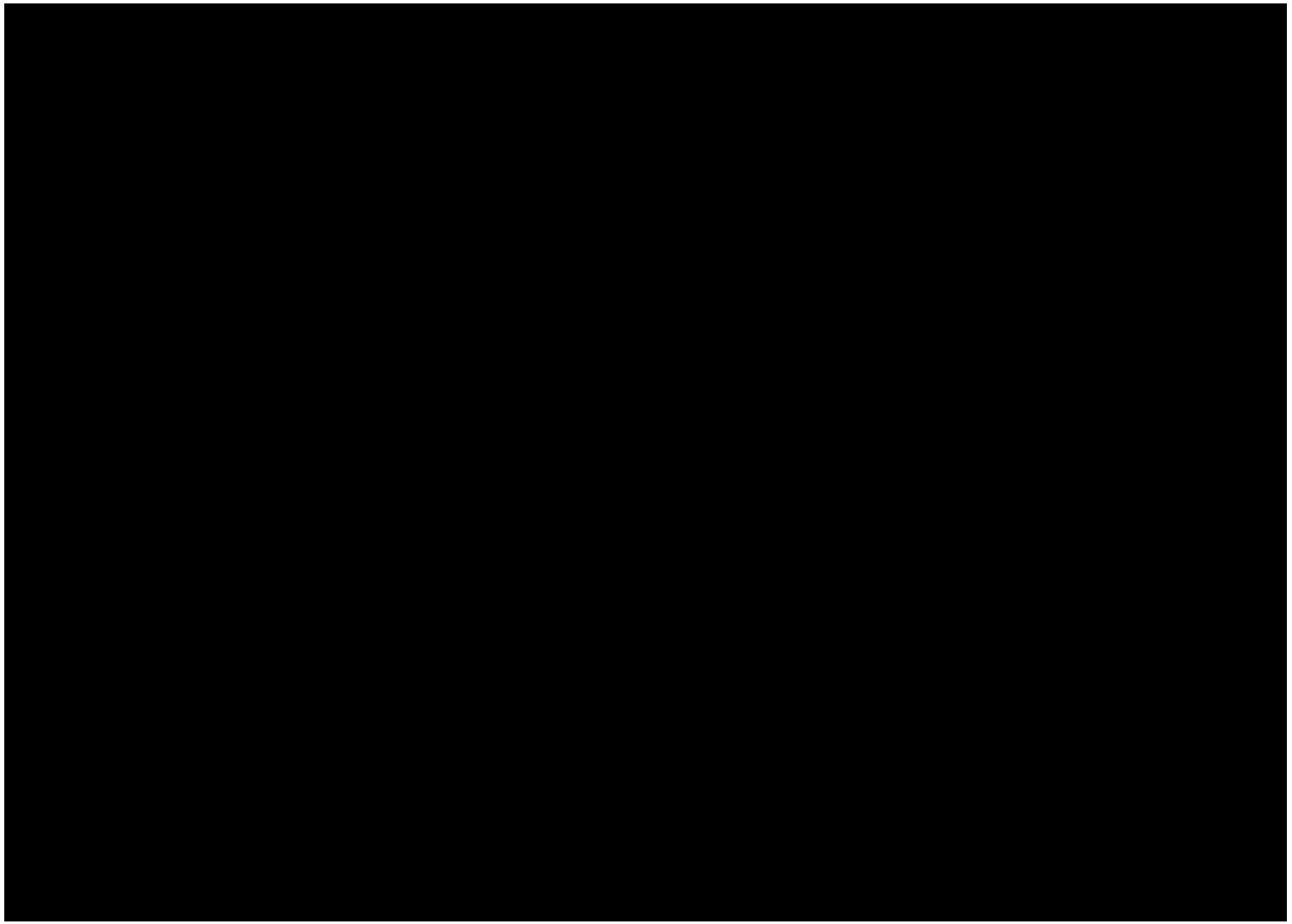
[redacted]

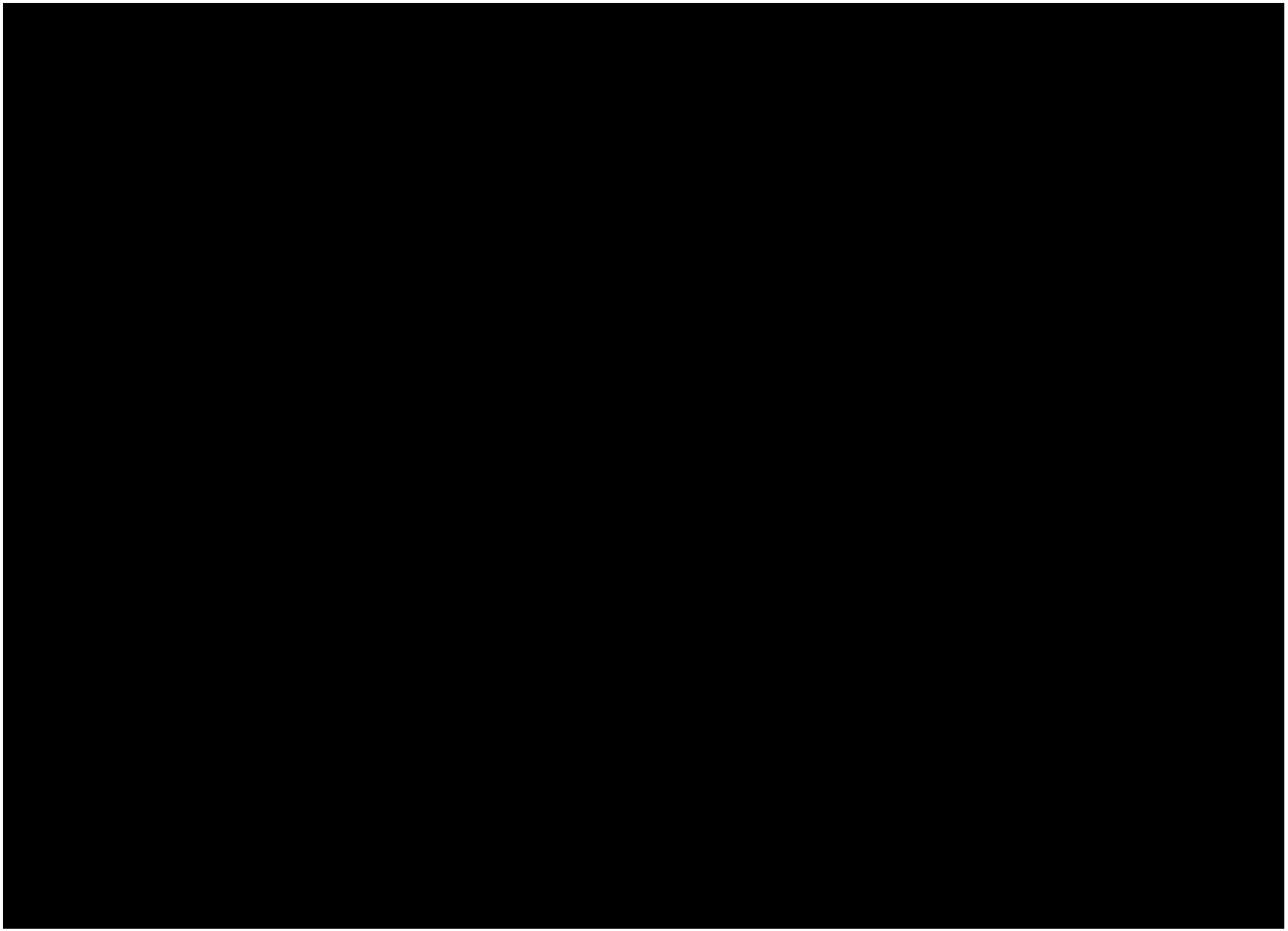
Minutes of a meeting of the: **QIP Stakeholder group. Reduction paediatric referrals for wound closure**
held at **9am Tuesday 23rd June**
Room **EM seminar room,** [redacted]

Present:	
[redacted]	[redacted]
[redacted]	
Apologies:	
[redacted]	

Agenda Item	Discussion and Action Points	Action by
1)	LAT gel procurement and costings from Torbay Pharmaceuticals to be finalised before MMC meeting.	MT
2)	LAT gel guideline to be finalised for MMC presentation Attached to MMC agenda for circulation prior to meeting	JW MT
3)	Preparation for application to MMC and Questions likely to be asked at meeting: -Why authorise a 'special' unlicensed product over similar licensed topical lidocaine products. -What is the evidence for using the product -What is the cost/clinical benefit when compared with existing treatment - What would be the total cost/ total numbers expected across 12 months - Do Newcastle/ Northumbria/ South Tyneside use this product in this indication Need to acknowledge that there are a significant number of complications in using specials/ unlicensed products, including: - a requirement for named patient ordering by consultant -very short expiry dates -weak supply chain as only one small manufacturer.	JW & MT

2) Minutes of Medicines Management Committee meeting – 8th July 2015





Appendix D- 4-month re-audit

Age	Mechanism	Site	Length	Depth	Closure	Successful	Referred	Practitioner	Why specialist Referral?
5	Stone	Forehead	3mm	Superficial	Glue	Y	N	ENP	
1	Fall	Forehead	2cm	Superficial	No	N/A	Plastics	ST6	
15	Knife	Finger	1cm	Superficial	Steristrips	Y	N	ENP	
7	Fall	Forehead	1.5cm	Deep	LAT Sutures	Y	N	Reg	
4	Glass	Foot	n/d	Superficial	Not Needed	N/A	N	ENP	
3	Fall	Lip	3mm	Superficial	Not Needed	N/A	N	ENP	
8	Trapped	Finger	2.5mm	Superficial	Steristrips	Y	N	ENP	
7	Car Boot	Lip	N/D	Superficial	Not Needed	N/A	N	Consultant	
7	Fall	Inside Lip	3mm	2mm	Not Needed	N/A	N	ENP	
8	Fall	Chin	5mm	N/D	Glue	Y	N	ENP	
11m	Fall	Face	2mm	Superficial	Glue	Yes	N	CT3	
3	Broken Cup	Lip	4mm	Superficial	Not Needed	N/A	N	Reg	
2	Jammed	Finger	n/d	Superficial	No	N/A	N	ENP	
11	Fall	Head	9cm	N/D	Staples	Yes	N	ENP	
5	Collision	Tongue	6mm	Full thickness	No	N/A	MaxFax	CT3	Tongue (Lat gel c/l)
2	Fall	Head	1cm	Superficial	Glue	Y	N	ST6	
5	fall	leg	5mm	2mm	Steristrips	Y	N	ENP	
1	Fall	Inside Lip	1cm	N/D	N/A	N/A	N	Consultant	
3	Fall	Head	1cm	3mm	Glue	Y	N	ENP	
6	Karate	Foot	1cm	2mm	Steristrips	Y	N	ENP	
8	Fall	Chin	3cm	3mm	Steristrips	Y	N	ENP	
8	Trapped	Finger	1cm	2mm	N/A	N/A	N	ENP	
2	Fall	Chin	5mm	N/D	Steristrips	y	n	ST6	
2	Fall	Forehead	n/d	N/D	Steristrips	y	n	Staff Grade	
15	Knife	thumb	1.5cm	N/D	Steristrips	y	n	CT3	

7	Fall	thumb	1cm	Superficial	Not Needed	N/A	n/a	ENP
2	Fall	Forehead	2cm	N/D	Steristrips	y	n	Staff Grade
1	Fall	head	5mm	Superficial	Glue	y	n	ENP
5	Fall	face	5mm	1mm	Glue	y	n	ENP
3	Fall	eyebrow	1cm	1mm	no	N/A	Plastics	ENP
14m	Collision	Forehead	5mm	1mm	Glue	y	n	ENP
15	punched	cheek	5mm	deep	sutures	y	n	st6
5	Fall	Forehead	2cm	3mm	Glue/steristrips	y	n	ENP
14	Fall	head	n/d	N/D	Glue	y	n	rag
11	hit by branch	leg	2cm	4mm	LA Sutures	y	n	ENP / Reg
5	Fall	Forehead	1.5cm	superficial	Glue /Steristrips	y	n	ENP
20m	Fall	Forehead	1cm	2mm	Glue	y	n	ENP
4	Collision	Head	2cm	1mm	Glue	y	n	ENP
7	Collision	Forehead	2cm	Full thickness	no	n/a	Plastics	ENP
1	Fall	Forehead	2mm	N/D	Glue	y	n	ST6
21m	Fall	head	3cm	Superficial	Glue	y	n	ST3
7	Tin can	ankle	2cm	1mm	LAT Sutures	y	n	ST6
2	Fall	head	5mm	1mm	Glue	y	n	ENP
3	Fall	Forehead	1cm	1mm	Glue	y	n	ENP
2	Collision	head	1cm	1mm	Glue	y	n	ENP
7	Fall	knee	1cm	1mm	Steristrips	y	n	ENP
10	Fall	face	5mm	1mm	Steristrips	y	n	ENP
5	Collision	Forehead	n/d	N/D	Steristrips	y	n	ENP
3	Glass	thumb	1cm	Superficial	Steristrips	y	n	ENP
4	Fall	head	1cm	N/D	Glue	y	n	ENP
2	Screw	thigh	1cm	1mm	Glue	y	n	ENP
2	Glass	base on thumb	1cm	Superficial	LAT Sutures	y	n	Reg
4	Fall	Forehead	1.5cm	Superficial	Glue Steristrips	y	n	F2

7	Fall	Tongue	n/d	Superficial	N/A	N/A	n/a	ENP	
14	Collision	scalp	1cm	N/D	Not Needed	N/A	n	rag	
3	Fall	Head	1cm	Superficial	glue	y	n	rag	
2	Fall	Forehead	2cm	Full thickness	LAT Sutures	y	n	Consultant	
9	Fall	knee	1cm	Superficial	Not Needed	N/A	n	ENP	
2	Fall	chin	2.5cm	Superficial	Glue	y	n	ENP	
5	Collision	eyebrow	1cm	1mm	Glue	y	n	ENP	
6	Fall	head	5mm	n/d	Glue	y	n	ENP	
6	Fall	head	1.5cm	Superficial	Glue	y	n	CT1	
3	Fall	face	2cm	deep	No	n/a	plastics	ENP	
4	fall	lip	5mm	Superficial	Not Needed	N/A	n	CT1	
4	Fall	head	2mm	Superficial	glue	y	n	ENP	
13	scissors	knee	1cm	Superficial	Steristrips	y	n	ENP	
9	fall	Head	1cm	2mm	glue	y	n	ENP	
5m	Fall	Head	2cm	1mm	glue	y	n	ENP	
2	Fall	eyebrow	1cm	2mm	glue	y	n	ENP	
4	car door	Finger	2mm	Superficial	Not Needed	N/A	n	ENP	
11	Fall	shin	2.5cm	n/d	Steristrips	y	n	ENP	
10	Collision	face	8mm	1mm	Steristrips	y	n	ENP	
6	fall	Forehead	1cm	deep	glue	y	n	ENP	
9	Fall	eyebrow	4mm	1mm	Steristrips	y	n	ENP	
3	knife	hand	2cm	5mm	No	N/A	Plastics	Consultant	?digital nerve injury
9	Collision	face	2cm	Superficial	Glue	y	n	ct3	
1	Fall	forehead	n/d	n/D	Glue	y	n	ct3	
4	Fall	back	3cm	deep	LAT Sutures	y	n	ct3	
7m	falling object	eyebrow	5mm	n/d	No	N/A	n	Consultant	
16m	fall	eyebrow	2cm	deep	No	N/A	Plastics	ENP	
14	glass	leg	n/d	Superficial	Steristrips	Y	n	ENP	
4	fall	lip	2mm	1mm	Glue	Y	n	ENP	

2	crush	Finger	n/d	Superficial	Steristrips	Y	n	ENP	
3	fall	face	n/d	n/d	Steristrips	Y	n	ENP	
5	fall	head	8mm	2mm	Glue	Y	n	ENP	
11	fall	head	small	n/d	Glue	Y	n	Reg	
9	knife	Finger	small	Superficial	Not Needed	N/A	n	ENP	
7	fall	eyebrow	4mm	1mm	Steristrips	Y	n	ENP	
15	fall	chin	1cm	partial thickness	Glue	Y	n	ENP	
9m	fall	face	1cm	Superficial	Steristrips	Y	n	CT3	
2	Glass	face	1.5cm	n/d	No	N/A	Plastics	ENP	
6	fall	head	small	Superficial	Not Needed	N/A	n	ENP	
5	fall	lip	small	n/d	Not Needed	N/A	n	ENP	
6	Collision	eyebrow	0.75cm	1mm	Glue	Y	n	ENP	
7	Collision	Forehead	1.5cm	n/d	Steristrips	Y	n	CT3	
3	fall	Forehead	n/d	n/d	Steristrips	Y	n	CT3	
9	glass	foot	n/d	n/d	LAT Sutures	Y	n	CT3	
3	fall	Forehead	1.5cm	1mm	Steristrips	Y	n	Staff Grade	
11	fall	leg	2cm	deep	L A Sutures	Y	n	Consultant	
3	fall	ear	4mm	Superficial	Glue	Y	n	ST6	

Key		
		Referrals for Non-specialist closure
	Red Text	Referrals for specialist closure
		LAT gel used
	N/D	Not documented

Appendix E – 12-month re-audit

Age	Mechanism	Site	Length	Depth	Closure	Successful	Referral	Practitioner	Why Referred
11	fall	knee	4cm	deep sc tissue	LAT Sutures	Y	No	REG	
4	fall	head	1cm	superficial	Glue	Y	No	ENP	
5	collision	head	1cm	superficial	Glue	Y	No	ENP	
11	fall	knee	6.5cm	full thickness	LAT Sutures	y	no	ENP	
4	fall	forehead	6mm	superficial	Steristrips	Y	No	ENP	
4	fall	forehead	1cm	superficial	Steristrips	Y	No	ENP	
15	Fighting	knuckle	2cm	deep	No	N/A	Plastics	ENP	possible flexor tendon
3	fall	forehead	1cm	2mm	Glue	Y	No	ENP	
15	fall	foot	5mm	scratch	Not Needed	N/A	No	ENP	
4	trapped	thumb	3mm	abrasion	Not Needed	N/A	No	ENP	
2	fall	forehead	1.5cm	partial thickness	Glue	Y	No	ENP	
3	Collison	forehead	3cm	deep	No	N/A	Plastics	GP	
14	fall	head	3cm	2mm	Staples	Y	No	REG	
7	fall	knee	2cm	superficial	Steristrips	Y	No	ENP	
4	fall	forehead	3cm	full thickness	No	N/A	Plastics	GP	
2	fall	forehead	3mm	2mm	Glue	Y	No	ENP	
8	fall	chin	5mm	2mm	Glue	Y	No	ENP	
10	fall	knee	3cm	deep	LAT Sutures	y	No	f2	
11	fall	shin	2cm	1mm	Steristrips	Y	No	ENP	
15	fall	scalp	5cm	2mm	Staples	Y	No	ENP	

3	fall	forehead	4cm	full thickness	No	N/A	Plastics	Consultant
1	collision	forehead	2cm	superficial	Glue	Y	No	ENP
10	fall	head	2cm	1mm	Glue	Y	No	ENP
12	cut plate	thumb	3cm	1mm	Steristrips	Y	No	ENP
8	fall	eyebrow	5mm	1mm	Glue	Y	No	ENP
14	fall	thumb	1.5cm	n/d	Steristrips	Y	No	ENP
10	fall	lip	75mm	n/d	Glue	y	No	end
13	dog	bite arm	5mm	n/d	no	N/A	no	end
10	fall	knee	6mm	superficial	Steristrips	y	No	ENP
14	fall	finger	1.5cm	1mm	Steristrips	y	No	ENP
3	Collison	head	3cm	3mm	Staples	y	No	ENP
2	fall	head	1.3cm	superficial	glue	y	No	Consultant
1	fall	forehead	2cm	n/d	Steristrips	y	No	ENP
2	fall	forehead	1cm	1mm	Steristrips	y	No	ENP
4	collision	forehead	1.5cm	1mm	Steristrips	y	No	ENP
6	fall	forehead	2cm	2mm	Steristrips	y	No	rag
16	scissors	thumb	5mm	n/d	Not Needed	N/A	No	rag
10	fall	head	1.5cm	superficial	Glue	y	No	rag
9	fence	shin	4cm	full thickness	LAT Sutures	y	No	ENP
16	scissors	finger	1 cm	scratch	no	N/A	No	ENP
1	fall	eyebrow	5mm	superficial	glue	y	No	ENP
4	fall	chest	5mm	superficial	Not Needed	N/A	no	ENP
1	fall	forehead	2.5cm	deep	no	N/A	Plastics	REG
15	fall	scalp	3cm	3mm	Staples	y	No	f2
11	scissors	hand	2.5cm	2mm	LA Sutures	y	no	ENP

14	fall	face	2.5cm	partial thickness	LA Sutures	y	No	CT1	
6	fall	face	2cm	1mm	steristrips	yes	no	ENP	
6	fall	head	1.5cm	1mm	glue	y	No	ENP	
2	fall	lip	1cm	n/d	no	N/A	Plastics	GP/ENP	crosses vermillion border
16	tripped	toe	3cm	2mm	LA Sutures	y	No	REG	
14	tripped	forehead	1cm	superficial	glue	y	No	end	
15	fighting	hand	2cm	deep	no	N/A	Plastics	ENP	Possible flexor tendon
6	fall	chin	2cm	2mm	Steristrips	y	No	ENP	
1	nail	finger	1cm	superficial	Not Needed	N/A	No	REG	
3	fall	head	2.75cm	n/d	glue	y	No	ENP	
4	fall	forehead	5cm	2mm	glue/steristrips	y	No	ENP	
3	fall	forehead	1cm	2mm	glue	y	No	ENP	
7 months	nail clippers	finger	1mm	superficial	Not Needed	N/A	No	Consultant	
14	fall	forehead	2cm	n/d	Steristrips	y	No	ENP	
11	fall	shin	1cm	superficial	Steristrips	y	No	ENP	
12	fall	eyebrow	1cm	superficial	Steristrips	y	No	ENP	
5	fall	forehead	5mm	superficial	glue	y	No	REG	
3	collision	scalp	1.5cm	superficial	glue	y	No	ENP	
2	fall	face	1cm	1mm	Steristrips	y	No	ENP	
3	fall	face	5mm	2mm	glue	y	No	ENP	
3	fall	nose	1.5cm	deep	no	n/a	Plastics	ENP	
12	stubbed	toe	5mm	superficial	glue	y	No	f2	
7	fall	eyebrow	2cm	superficial	glue	y	No	end	
13	trapped	hand	7.5mm	1mm	Steristrips	y	No	end	
1	fall	forehea	2cm	2mm	Steristrips	y	no	f2	

		d							
2	fall	head	4mm	n/d	glue	y	No	end	
2	fall	chin	2cm	2mm	glue	y	No	end	
1	collision	face	7mm	n/d	Steristrips	y	No	end	
8	fall	scalp	2cm	2mm	glue	y	No	end	
3	fall	scalp	1.5cm	2mm	glue	y	No	end	
14	fall	eyebrow	3cm	deep	LAT Sutures	y	No	enp/reg	
2	fall	leg	2cm	superficial	Steristrips	Y	No	Consultant	
5	fall	forehead	1cm	superficial	Steristrips	y	No	end	
2	fall	d	1cm	superficial	glue	y	No	end	
9	fall	scalp	5mm	n/d	glue	y	No	ENP	
2	fall	chin	1.5cm	1mm	Steristrips	y	No	REG	
13	fall	eyebrow	1cm	1mm	glue	y	No	ENP	
16	fall	head	3cm	2mm	glue	y	No	ENP	
5	collision	face	5mm	n/d	not needed	N/A	No	REG	
4	fall	finger	1.5cm	1mm	Steristrips	y	No	ENP	
4	fall	chin	2.5cm	2mm	Steristrips	y	No	ENP	
	fall off								
10	ladder	back	4cm	deep	no	n/a	ortho	Consultant	Removal fb
6months	rolled floor	intraoral	3mm	n/d	Not Needed	n/a	No	ENP	
4	fall	scalp	1cm	1mm	glue	y	No	ENP	
2	fall	chin	2cm	1mm	Steristrips	yes	no	ENP	
8	glass	finger	1.5cm	deep	no	n/a	Plastics	ENP	Possible flexor tendon
15	fall	knee	5cm	deep s/c tissue	LA Sutures	y	No	ENP	
11	fall	hand	1cm	2mm	Not Needed	n/a	No	ENP	
10	fall	shin	3cm	superficial	Steristrips	y	No	ENP	
3	trapped	hand	1cm	1mm	Steristrips	y	No	ENP	
10	fall	finger	1.5cm	n/d	Steristrips	y	No	ENP	
16	trapped	finger	1cm	n/d	steristrips	y	No	REG	

16	nail	finger	2cm	n/d	Steristrips	y	No	F2	
6	fall	knee	3cm	2mm	Steristrips	y	No	ENP	
13	glass	hand	2cm	3mm	LAT Sutures	y	No	Reg	

Key		
		Referrals for Non- specialist closure
	Red Text	Referrals for specialist closure
		LAT gel used
	N/D	Not documented