



ORIGINAL ARTICLE

The impact of a multidisciplinary care package for vaccination in needle phobic children: An observational study

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Aims: Children with severe needle phobia find vaccination extremely distressing and can remain unvaccinated, which puts them at an increased risk of contracting and transmitting vaccine preventable disease. Referral to a specialist or hospital service may occur when they cannot be safely vaccinated in the community, but engagement of allied health services can be inconsistent. The aim of the study was to assess the impact of a multidisciplinary, consumer-oriented model of care on vaccinations for needle phobic children.

Methods: Needle phobic children aged between 6 and 16 years attended multidisciplinary consultation, as part of a care package, to assess previous experiences and determine the level of intervention that was required to support vaccination. A multidisciplinary case meeting followed this appointment and an individualised plan formulated for each patient. The main outcome of the project was rate of successful vaccination.

Results: The care package resulted in a successful vaccination rate of 83% ($n = 20$) with 69 vaccines administered across three clinics. Of those successful, 90% required multiple injections per visit. The majority of patients indicated moderate to high level of anxiety. Supportive care was escalated and de-escalated as tolerated.

Conclusions: Results demonstrate the diversity of patients presenting with needle phobia and indicate an individualised, collaborative approach is preferable to a 'one size fits all' model of care. The study highlights a need for the development of guidelines that streamline the assessment and individualisation of procedural anxiety plans to meet patient needs and embed these processes into standard care.

Key words: behavioural; general paediatrics; immunisation; pain.

What is already known on this topic

- 1 Needle phobic patients are a sub-group of the population which pose significant challenges to successful vaccination.
- 2 Needle phobic children and young people can remain unvaccinated increasing their risk of contracting a vaccine preventable disease.
- 3 Needle phobic patients have a diverse range of underlying medical conditions and experiences which contribute to their phobia.

What this paper adds

- 1 Levels of non-pharmacological and pharmacological support vary for this patient cohort.
- 2 Pharmacological intervention should be delivered in conjunction with non-pharmacological interventions to support better outcomes.
- 3 Individualised, collaborative care-optimised vaccination outcomes for needle phobic children.

Vaccination has proven to be one of the most beneficial and cost-effective public health interventions, preventing an estimated 2.5 million deaths globally each year.¹ Certain community cohorts require extra support to increase rates of vaccination. Children

with needle phobia are included in the subgroup of the population that are more challenging to vaccinate.

Needle phobia is a persistent, excessive and unreasonable fear of injections or needles that affects approximately 10–25% of the population.^{2–7} It often becomes apparent around 5 years of age resulting in significant psychological and physiological distress for the child and parent. Needle phobic children may remain unvaccinated placing them at a greater risk of contracting a vaccine preventable disease and lowering herd immunity in the community. Needle phobia may also contribute to medical non-compliance and an avoidance of health care continuing into adulthood, resulting in higher morbidity and mortality.^{4–6,8–11}

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Conflict of interest: The authors declare there are no other conflicts of interest to report.

Accepted for publication 6 February 2022.

Vaccinations are one of the most common needle procedures in children and can evoke intense feelings of pain and fear.^{3,9} Poorly managed procedural pain may lead to increased levels of fear over time and reduce the effectiveness of analgesia for ensuing procedures.^{9,11} Conversely, painful experiences may be favourably influenced by adequately managing the pain and fear associated with the procedure.¹¹

In Australia, legislative changes have restricted access to publicly funded child care and educational facilities and withheld family welfare payments, if children are not immunised in accordance with the National Immunisation Program.¹² This results in further disadvantage for these children and their families; in most cases they do not meet the criteria for medical exemption and are penalised financially and options for education and care limited.

Our service and other paediatric centres in Australia receive referrals to support children with needle phobia who require more specialised support than can be provided in the community setting.⁸ Previous practice was often not coordinated, varied between clinicians and led to an inefficient use of resources. Extended clinician preparation time, telephone counselling, support from volunteer services and consultation with allied health professionals contributed to each encounter. This frequently resulted in low success rate with flow on effects of increased wait times for other children requiring specialist immunisation service input.

This report details the development, implementation and outcomes of a care package which aimed to deliver safe and successful vaccination to needle phobic children. The care package offered Parent and child input; Reduced wait time; Engage and entertain children; Pharmacological support where needed; Anaesthesia for skin; Reinforcement of positives by one voice; Education for parents; Distraction and relaxation. (The PREPARED Care package).

Methods

Development of the care package

Previous management of needle phobic patients presenting to the Queensland Specialist Immunisation service (QSIS) used an *ad hoc* referral system to multidisciplinary clinicians. Staff anecdotally reported a variable rate of successful vaccination and multiple visits for repeated attempts to vaccinate posed financial and logistical challenges for parents and legal guardians such as parking costs, work absences and caring for other children. Carers reported the process to be a stressful experience and staff raised personal safety concerns, especially in cases of children with severe neurodevelopmental disorders.

A multidisciplinary team was convened which consisted of specialist medical, nursing and pharmacy staff, anaesthetists and occupational therapists. The development of the care package was based on the six key elements of procedural pain management as highlighted in the Children's Health Queensland Procedural Pain Management Overarching Framework: planning, preparation, pharmacological, psychological, physical and the promotion of recovery and resilience (Table 1). It was initially designed so that children could attend the clinics, undergo initial assessment and consult multidisciplinary clinicians as required

before proceeding to vaccination with the appropriate plan of support.

Plans included a range of techniques and interventions including but not limited to, the use of topical anaesthetics and skin cooling; clinician or child led distraction; utilising Virtual Reality (VR) goggles; therapist guided breathing techniques; patient controlled inhaled nitrous oxide at 50% concentration (Entonox); clinician controlled inhaled nitrous oxide up to 70% concentration (Quantiflex); and at later clinics, the use of oral sedatives. Extensive consideration was also given to positioning of the child; injection technique; and priority and order of injections. The project sought to minimise anticipatory anxiety on the day by staggering appointment times and involving volunteer services and the Starlight Foundation, an organisation which focuses on play and fun for children in hospital, to engage and distract waiting children.

Ethical considerations

Ethics approval was granted by the Children's Health Queensland Human Research Ethics Committee. Participants were identified at the time of referral and QSIS staff contacted parents/legal guardians to explain the project and seek interest in participation. The alternative to participation in the project was to continue treatment as per current management. A parent information pack was posted which included a parent information statement and a fact sheet to assist parents to prepare their child for the initial visit. Full written informed consent was obtained on the day of appointment.

Implementation of the care package

Three PREPARED clinics were conducted between October 2018 and June 2019. The first clinic comprised multidisciplinary consultation in the morning and vaccination attempted in the appropriate clinical area in the afternoon. Children requiring non-pharmacological support were referred to the immunisation centre for vaccination. Children requiring Entonox attended the outpatients department for vaccination by QSIS staff, and those requiring maximum support attended the Medical Day Unit (MDU) for vaccination under Quantiflex administered by a senior paediatric anaesthetist. The use of oral sedatives was not considered for the first clinic.

The all-day visit format of the first clinic did not occur for subsequent clinics due to lack of success. Subsequent clinics used a modified format which also included the option of oral sedation. The new format consisted of a two-staged approach. The first stage involved a multidisciplinary consult with the option to attempt vaccination in the immunisation clinic the same day, if deemed appropriate. A team case meeting occurred post this consultation and an individualised plan was formulated for each child. The nursing role was coordination and vaccination; medical officers facilitated sedation; pharmacy arranged medical gases and dispensing of medications and vaccines; and OT consulted all patients and provided support where indicated.

Children who had been unsuccessful at the first clinic were also included. The plan for care was dependent on the cognitive level of the child, experiences of previous vaccination attempts and prior use of multidisciplinary services. Parent and child input were also incorporated into the individualised plan. Children were

Table 1 Children’s Health Queensland procedural pain management overarching framework

Planning	Initial assessment of the child and distribution of parent information packs
Preparation	Co-development of procedural plans with participants
Pharmacological	Pharmacological support in the form of topical anaesthetics, sedatives and anxiolytics was utilised if indicated
Psychological	Community psychologists were involved if participants were existing patients and psychological support was also provided by clinician-led distraction
Physical	Age appropriate positioning for comfort and safety
Promote recovery and resilience	Praising attempts, celebrating success and following through with rewards

progressed to the next visit according to their individualised plans (Fig. 1). Patients requiring non-pharmacological support and Entonox attended the immunisation clinic or outpatient department. Patients requiring Quantiflex with or without oral sedation were booked into a predetermined session in the MDU with an anaesthetist in attendance. Patients who were unsuccessful at vaccination were escalated to additional support as appropriate for their next attempt, and successfully vaccinated patients’ level of support was de-escalated where possible for subsequent visits.

Children were positioned age appropriately and dependant on the level of support required to vaccinate. Children vaccinated without pharmacological support were sat upright in cuddle position (for younger children) or seated solo. Children using analgesics and anxiolytics were positioned semi-reclined on a bed for safety. A ‘one voice’ approach was used to promote a quiet and calm

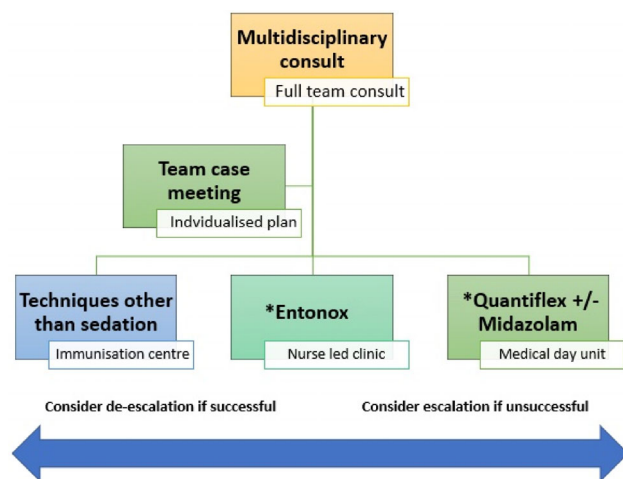


Fig. 1 The modified version of the PREPARED clinics was a two-staged approach. *In conjunction with non-pharmacological support.

environment. Topical anaesthetics and skin cooling agents were offered and utilised if the child indicated a preference for their use.

All vaccinators were senior Immunisation Program Nurses with greater than 5 years’ experience in vaccinating paediatric patients. Vaccines were administered intramuscularly according to national recommendations.¹ Careful thought was given to the priority of vaccines in case the child became distressed and all vaccines planned for that encounter could not be delivered. Consideration was also given to the order of administration of vaccines in that those potentially more painful were generally administered last.¹³

Outcome measures and analysis

Outcome measures of the pilot clinics related to the objectives of safety, successful vaccination and consumer satisfaction. There were no incidences of physical harm or safety concerns raised for the duration of the project. Successful vaccination was determined by whether a vaccine was successfully administered, the number of vaccines administered per encounter, and whether the child returned for subsequent doses with or without de-escalation. If care was escalated to higher support after an unsuccessful attempt, the highest level of support required to vaccinate was recorded. Consumer satisfaction was reported using an 18 Question Short-form Patient Satisfaction Questionnaire (PSQ-18) that had been used for other pilot clinics within the hospital and health service. Parents completed the PSQ-18 on behalf of the child and data was collated from the responses given at the time of the final visit. Levels of anxiety were measured using modified validated visual anxiety scales (VAS) at each visit.

Descriptive statistics were calculated and presented as percentage of participants successfully vaccinated and returning for subsequent visits. Patient satisfaction questionnaire responses were in

Table 2 Participant information

Demographics	n = 24
Median age in years: n (range)	14 (6–16)
Reason/s for referral: n (%)	
Needle phobia/procedural anxiety	13 (54)
Anxiety disorder	8 (33)
Neurodevelopmental disorder	11 (45)
Medical at risk: n (%)	
Yes	7 (29)*
No	17 (71)
Highest level of support required: n (%)	
Child/clinician-led distraction	5 (21)
Clinical hold	1 (4)
Entonox	5 (21)
Exclusive Quantiflex	1 (4)
Combination Quantiflex and oral Midazolam (0.5 mg/kg)*	5 (21)
Exclusive oral Midazolam (0.5 mg/kg)*	1 (4)
General anaesthesia for unrelated procedure	2 (8)
Not vaccinated	4 (16)

* MAR diagnoses included diabetes, asthma, cardiac, liver, cochlear implant, rheumatology, coeliac.

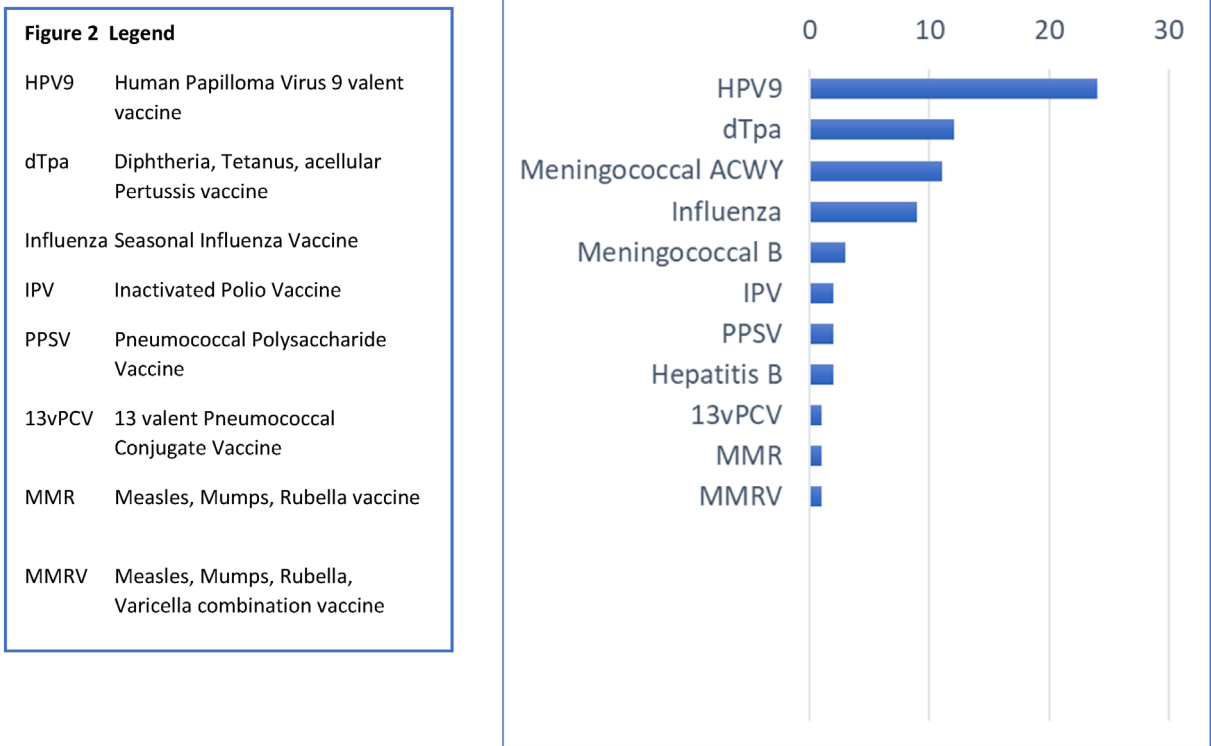


Fig. 2 Vaccines administered across all encounters.

the form of Likert scales to statements about delivery of care and were collated and presented as summarised common responses. VAS responses were collated and summarised.

Results

Twenty-four children participated in the project overall. Nine children attended the first clinic in the original format, and only four (44%) were successful. Some reasons contributing to the limited success of the first clinic were thought to be lack of oral

sedation and the all-day clinic format generating increased anticipatory anxiety due to prolonged time at the hospital. Of the four children who were successful, one used Entonox, one used clinician led distraction (Occupational Therapist), one used child led distraction and one was vaccinated using Quantiflex. Eight children who attended the initial clinic attended subsequent clinics for further attempts and/or successive doses of vaccine. This may have impacted the success of subsequent clinics in the modified format, which experienced success rates of 91% and 67%, respectively.

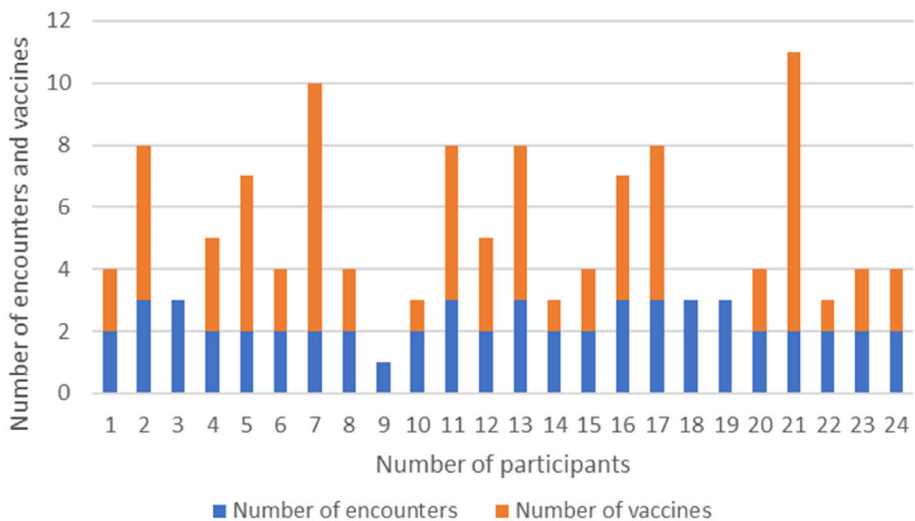


Fig. 3 Number of encounters and vaccines administered per participant.

Table 3 Sedation required per encounter

Sedation required for encounter, <i>n</i> = 55	Number of encounters
No sedation	28
Entonox	11
Quantiflex only	1
Midazolam only	11
Quantiflex and Midazolam	11
General anaesthetic (for unrelated reasons)	2
Total number of encounters requiring sedation, <i>n</i> (%)	27(49)

Demographics

Demographic data of patients attending the clinics is presented in Table 2. The median age of participants was 13 years and the reasons for referral were recorded as documented in the patient's medical chart. Many patients had associated anxiety disorders,

had experienced prior episodes of medical trauma, or had neurodevelopmental disorders. The majority did not meet Medically at Risk criteria as defined by the Australian Immunisation Handbook¹ and required National Immunisation Program vaccines.¹ Two children with severe neurodevelopmental disorders were vaccinated under general anaesthesia for unrelated medical procedures by coordinating with the treating teams. Vaccines administered during the project are outlined in Figure 2 with the HPV9 vaccine being the most commonly administered vaccine.

Successful vaccination

Participants were due 73 vaccines in total. The care package resulted in 69 vaccines delivered across 55 separate encounters, which is 88% of vaccines due (Fig. 3). Participants may have required multiple encounters because they required more than one dose or because they were initially unsuccessful. Eighty-three percent (*n* = 20) were successfully vaccinated and 49% of encounters required sedation of Entonox or more (Table 3). Ninety percent of those successful required multiple vaccines per visit. Ten participants successfully returned for subsequent doses of vaccines.

Table 4 PSQ-18 responses

Completed PSQ-18: <i>n</i> = 14	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
1. Doctors are good about explaining the reason for medical tests	9	4	1	0	0
2. I think my doctor's office has everything needed to provide complete medical care	10	3	1	0	0
3. The medical care I have been receiving is just about perfect	10	3	1	0	0
4. Sometimes doctors make me wonder if their diagnosis is correct	1	0	1	6	6
5. I feel confident that I can get the medical care I need without being set back financially	6	3	4	1	0
6. When I go for medical care, they are careful to check everything when treating and examining me	8	4	2	0	0
7. I have to pay for more of my medical care than I can afford	2	0	5	3	4
8. I have easy access to the medical specialists I need	7	4	1	1	0
9. When I get medical care, people have to wait too long for emergency treatment	1	2	4	4	2
10. Doctors act too business like and impersonal towards me	0	1	1	8	4
11. My doctors treat me in a very friendly and courteous manner	8	4	1	1	0
12. Those who provide my medical care sometimes hurry too much when they treat me	1	0	1	8	4
13. Doctors sometimes ignore what I tell them	0	1	0	7	6
14. I have some doubts about the ability of the doctors who treat me	1	0	1	8	5
15. Doctors usually spend plenty of time with me	8	4	1	0	1
16. I find it hard to get an appointment for medical care right away	1	1	5	3	4
17. I am dissatisfied with some things about the medical care I receive	1	0	0	8	5
18. I am able to get medical care whenever I need it	6	6	0	0	2

PSQ-18, 18 Question Short-form Patient Satisfaction Questionnaire.

Reasons for failure were varied and dependent on factors such as the presence of neurodevelopmental or pre-existing anxiety disorders. Patients not successfully vaccinated continue to attend the specialist immunisation service with ongoing support from OT and psychology where applicable. Temporary immunisation exemptions were considered in extreme circumstances.

Visual anxiety scales

Seventeen participants completed at least one VAS with nine completing multiple responses. Majority (71%, $n = 12$) indicated a visual anxiety score of five or more out of 10, (10 represents highest level of anxiety and zero being the lowest). Two of the nine participants who completed multiple responses indicated a reduction in anxiety of two or more points at subsequent visits.

Consumer satisfaction

Consumer satisfaction responses are summarised in Table 4. Overall, 93% indicated the care received was almost perfect. Most (86%) thought that enough time was spent with the child and 79% indicated easy access to specialists.

Discussion

This report details the implementation and outcomes of the PREPARED Care Package for needle phobic children in a tertiary children's hospital with a specialist immunisation service. Participants utilising the package ranged from those with moderate to significant needle phobia and many with neurodevelopmental disorders. Medical history requiring potentially painful procedures also appeared to be contributing factors among this particular group of children. Many parents described a previous traumatic experience which they felt had been instrumental to the development of needle phobia. This is consistent with literature describing needle phobia as resulting from a combination of inherited behaviour and life experience.^{4,9,10} While it is thought health-care behaviours in adulthood are directly influenced by medical experiences in childhood,¹¹ it has also been reported that approximately 80% of needle phobic adults have a first degree relative that displays the same fearfulness.^{4,10}

A strength of this study was in planning the PREPARED Care Package, the team placed considerable emphasis on supporting children to manage their needle phobia long term, as opposed to the approach of facilitating a one-off successful vaccination. Children who attempted Entonox and were unsuccessful were 'stepped up' to a Quantiflex attempt at the next available session and were praised for their attempt even though vaccination did not take place. Two children who required oral sedation and Quantiflex to be vaccinated felt confident enough to try Quantiflex alone at the subsequent visit and are planned for descalation to Entonox for future vaccination visits.

Some limitations were the small sample size and the use of the VAS. While the VAS is short, responsive and easy to use, it did not measure children's anxiety levels in detail. Another limitation was that Quantiflex could only be administered by an anaesthetist according to current organisational policy. Resourcing of health services may also impact replication of the care package.

Anticipatory anxiety appears to contribute significantly to children's perception of pain with those who have greater anticipatory anxiety being found to report higher pain scores.^{10,11,14} Recognising the potential negative impact of anticipatory anxiety upon successful vaccination was a factor in design of the care package and influenced the decision to modify the format so waiting times were minimised. Parental anxiety has also been identified to influence children's perceptions of pain^{5,9,10}; therefore, encouraging parents to use positive support can assist in reducing the distress and anxiety of the child.⁵ Parents were provided with written information prior to attending the clinic which outlined ways they could support their child during the appointment. Some suggestions were to talk about why vaccinations were necessary and consider writing a plan with the child that detailed strategies they could use if they felt scared or worried, like listening to music, watching a video or using breathing techniques. The information also introduced the use of positive language and reinforcement of coping behaviour.

Outcomes of the project provide data to inform the development of new pathways for needle phobic children referred to specialist immunisation services and were consistent with findings from a Melbourne study which found individualised plans for vaccination were beneficial for children who had failed attempts to vaccinate in the community.⁸ Referring clinicians should be encouraged to initially access community resources with a focus on care of underlying generalised anxiety and the association with needle phobia or procedural anxiety. The development of a sustainable process to manage procedural sedation in both outpatient and ward settings would give access to all children requiring extensive support to undergo painful procedures including vaccination. Multidisciplinary collaboration promotes a streamlined process of facilitating opportunistic vaccinations of children with severe neurodevelopmental disorders under general anaesthetic for simple procedures where possible.

Conclusions

Results of the implementation of the PREPARED package demonstrated a multidisciplinary, patient centred model of care can lead to high success rates in vaccination of needle phobic children. The health economic benefits of this model of care require further assessment.

Project outcomes suggest a review of current practice within hospital settings would be beneficial to ensure the standard of care provided to all children presenting for immunisation, minimises stress and trauma and mitigates negative experiences that may contribute to a fear of needles in the future.

Acknowledgements

The authors gratefully acknowledge the contributions of Cortney Sadleir, Alison Blaikie, Hannah Coulter, Anna Kinnane, Siobhan Gawrych, Vanessa Rich, Caitlyn Fletcher and Roxanne Taylor as clinicians comprising the multidisciplinary team. The authors would also like to acknowledge the in-kind support of Charmaine Griffin and her team from the Medical Day Unit, Air Liquide Healthcare, and the Starlight Foundation. Kind thanks to Dr. Paul Lee-Archer for revision of the manuscript. This project received a GlaxoSmithKline award via the Public Health Association of Australia at the 2018 National Immunisation Conference.

Open access publishing facilitated by Griffith University, as part of the Wiley - Griffith University agreement via the Council of Australian University Librarians. [Correction added on May 13, 2022, after first online publication: CAUL funding statement has been added.]

Ethical approval statement

This project had HREC approval from the Children's Health Queensland Human Research Ethics Committee. Approval number: HREC/QRCH/43548.

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