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'Our Care through Our Eyes'. Impact of a co-produced digital educational programme on nurses' knowledge, confidence and attitudes in providing care for children and young people who have self-harmed: a mixed-methods study in the UK

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ABSTRACT

Objectives (1) To determine the impact of a digital educational intervention on the knowledge, attitudes, confidence and behavioural intention of registered children's nurses working with children and young people (CYP) admitted with self-harm. (2) To explore the perceived impact, suitability and usefulness of the intervention.

Intervention A digital educational intervention that had been co-produced with CYP service users, registered children's nurses and academics.

Setting A prospective, uncontrolled, intervention study with preintervention and postintervention measurement, conducted at a large acute NHS Trust in the UK.

Participants From a pool of 251 registered children's nurses and 98 participants were recruited to complete the intervention (response rate=39%). At follow-up, 52% of participants completed the postintervention questionnaire, with 65% (n=33) of those reporting to have completed the digital educational intervention.

Primary outcome measures Attitude towards self-harm in CYP was measured using a 13-item questionnaire; knowledge of self-harm in CYP was measured through an adapted 12-item questionnaire; confidence in different areas of practice was measured through Likert Scale responses; self-efficacy for working with CYP who have self-harmed was measured through an adapted version of the Self-efficacy Towards Helping Scale; clinical behavioural intention was measured by the Continuing Professional Development Reaction Questionnaire. Semistructured interviews were undertaken with a purposive sample of participants.

Results For those who completed the intervention (n=33), improvements were observed in knowledge (effect size, ES: 0.69), confidence, and in some domains relating to attitudes (effectiveness domain-ES: 0.49), and clinical behavioural intention (belief about consequences-ES:0.49; moral norm-ES: 0.43; beliefs about capability-ES: 0.42). Qualitative findings suggest participants experienced skill development, feelings of empowerment and reflection on own practice.

Conclusions The effect of the intervention is promising and demonstrates the potential it has in improving registered children's nurse's knowledge, confidence and attitudes. However, further testing is required to confirm this.

Strengths and limitations of this study

- A novel, innovative, digital educational intervention (co-produced with service users, professionals and academics) improved children's nurses' knowledge, confidence, attitudes and clinical behavioural intention when caring for children and young people admitted with self-harm.
- A mixed-methods design permits the combining of both qualitative and quantitative approaches to data collection and analysis, to enable a thorough understanding of outcomes and process of an intervention.
- The study design (an uncontrolled preintervention and postintervention study) limits the opportunity for causal inference as there was no comparison group.
- High attrition of participants at follow-up limits the strength of the conclusions.

INTRODUCTION

Self-harm is one of the most frequent reasons for emergency hospital admission.[1] Children and young people (CYP) aged 11 years and 25 years have more hospital presentations for self-harm than any other age group.[2] In 2015–2016, there were 37 704 CYP under the

age of 19 years who were admitted to paediatric inpatient settings due to self-harm.[3] In line with national clinical guidance, it is recommended that following initial assessment and management in the emergency department, all CYP under the age of 16 years should be, 'admitted overnight to a paediatric ward and assessed fully the following day before discharge or further treatment and care is initiated'.[4, p.29] However, National Institute for Health and Care Excellence Clinical Guideline 16 reports that, 'The experience of care for people who self-harm is often unacceptable'.[4p.50] The way in which professionals respond to CYP who self-harm will directly impact on the person's engagement with support offered.[5] Negative experiences of interfacing with healthcare professionals, such as being exposed to stigma, can be a contributory factor in poor treatment adherence and ultimately, outcomes for this patient group.[6 7]

In the UK, the majority of registered children's nurses are trained at a preregistration and undergraduate level.[8] This training pathway enables children's nursing students to exit a minimum of a 3-year undergraduate curriculum and register as a children's nurse with the Nursing and Midwifery Council (UK). However, the specific content of this curriculum may vary according to the higher education institution of study, including education in relation to caring for CYP in mental health crisis.

Previous qualitative research has identified that registered children's nurses feel they lacked essential skills in effectively communicating with CYP with general mental health conditions, rendering them powerless and feeling unable to care for them in a confident and safe manner.[9–11] However, it has also been identified that nurses want to develop their skills and knowledge of mental healthcare to make children's experiences of admission safer and more worthwhile.[11] It is therefore crucial that nurses have training to equip them with the knowledge, skills and confidence necessary to provide the highest quality holistic care. Given that CYP with self-harm is the most common mental health presentation encountered by children's nurses it seems prudent that this should be the focus of any educational intervention. The planning and delivery of such training should involve those who self-harm to ensure it is relevant and meets the needs of those being cared for.[4] Training has been demonstrated to lead to consistent improvements in attitude and knowledge of health professionals in general medical settings caring for people who have self-harmed.[12] Collectively, there is justification for a CYP-led educational intervention that addresses deficits in nurses' knowledge, attitude and confidence in caring for hospitalised CYP who self-harm.

This paper reports the findings from a study which aimed to: (1) determine the impact of a digital educational intervention on registered children's nurses' knowledge, attitudes, confidence and behavioural intention of working with CYP admitted with self-harm; (2) explore perceived impact, suitability and usefulness of the digital educational intervention from the perspective of registered children's nurses.

METHODS

Design and setting

As outlined in the study protocol by Manning *et al*,[13] a mixed-methods design was used to investigate the impact of a novel, co-produced, digital educational intervention. The study involved: (1) an uncontrolled, predesign and postdesign using specific outcome measures to determine the impact on knowledge, attitudes, confidence and clinical behavioural intention; and (2) semistructured interviews with a purposive sample of participants to explore experience and usefulness.

The study was conducted at a single tertiary children's hospital, co-located in a large acute National Health Service (NHS) Trust.

Consent to participate in the preintervention and postintervention study was implied through completion of the baseline online questionnaire. This is advocated as an ethical and appropriate approach to obtaining consent for anonymous surveys as long as sufficient information about the study has been provided.[14] Therefore all eligible participants were sent a participant information sheet that described the study, explained what participation involved, and outlined any risks and benefits of participating. For the semistructured interviews, written informed consent was taken with participants prior to the interview as per good clinical practice guidance.[15]

Intervention

The intervention was a digital educational programme hosted on an online platform accessible at (http://sonet.nottingham.ac.uk/rlos/mentalhealth/octoe). The intervention was composed of reusable learning objects (RLOs) that had been co-produced with CYP service users, registered children's nurses and academics. RLOs are short, self-contained, focused 'chunks' of e-learning underpinned by learning theory comprising multimedia rich content, activities and self-assessment.[16] The methodology for the RLO development was produced by the Centre for Excellence in Teaching and Learning in RLOs based on the Agile development workflow[17 18] that included a validated specification, and review tools for each stage of the process (details outlined in the study protocol).[13] The final digital educational intervention consisted of three RLOs which focused on a different aspect of care that included: (1) Understanding self-harm and care pathways for CYP admitted to hospital (http://sonet.nottingham.ac.uk/rlos/mentalhealth/octoe/knowledge/index.html); (2) Effective communication with CYP following self-harm admission (http://sonet.nottingham.ac.uk/rlos/mentalhealth/octoe/communication/index.html); and (3) Assessing risk and managing safety with CYP admitted with self-harm (http://sonet.nottingham.ac.uk/rlos/mentalhealth/octoe/risk/index.html). The specific content varied across the three RLOs but information included was evidence-based and expert peer-reviewed as part of the development process. The content was delivered through a range of multimedia to enhance the interest and authenticity, such as videos of

youth actors narrating the experiences of CYP admitted to hospital with self-harm.

The digital educational intervention was initially piloted with seven student nurses (child field) in order to test the functionality, face validity and time requirement. Findings from this pilot demonstrated that the digital educational intervention functioned appropriately on a range of platforms (such as Macintosh Operating System and Windows) and devices (such as Personal Computer, iPad, iPhone, Android phone), and appeared acceptable to the target population in terms of usability and time requirement.

Sample

Eligibility criteria

All children's nurses within the targeted setting meeting the following eligibility criteria were invited to participate:

Inclusion criteria

1. Registered children's nurse with the Nursing and Midwifery Council, UK.
2. Currently provides acute care in the following nine clinical areas: paediatric critical care; renal and urology; medical short stay; children's assessment unit; oncology; neurology; general surgery; ear nose throat/orthopaedics/maxillofacial; medical long stay.

Exclusion criteria

1. Unwilling to provide consent to take part in the study.
2. Had taken part in the development of the digital educational intervention.

Sample size

As no previous research has been undertaken evaluating a similar resource on the outcomes of interest in this study, no estimates of effect size were able to be made. As such, no sample size calculation was undertaken.

Data collection

Data were collected preintervention and postintervention via an online questionnaire (using the Bristol Online Survey).

A total of 251 registered children's nurses, from a single tertiary NHS Trust, were invited to participate in the study. Eligible participants were identified by a locally held database and emailed inviting to participate from the head nurse for CYP. The email contained an information sheet and invited registered children's nurses to complete the baseline online questionnaire which was made available for 4 weeks. Following this period, the digital educational intervention was made available to participants for 4 weeks, after which the postintervention questionnaire was made available for 2 weeks. An invitation email to complete the postintervention questionnaire was sent directly by the study team and sent to the participants who had completed the baseline questionnaire. Nurses who participated in the development of the digital educational intervention were excluded to avoid potential bias.

In an attempt to understand the immediate and wider context in which the digital educational programme was employed, and the variation in any impact observed, semistructured qualitative interviews were undertaken. As outlined by Mann *et al*[19] semistructured interviews allow for an in-depth exploration of the impact that local structures and processes have on the utilisation of interventions. Therefore, respondents of the postintervention questionnaire were invited to take part in a face-to-face or telephone semistructured interview. Participants were contacted directly by the study team via email inviting them to participate in an interview, were provided with a written information sheet and requested to contact the research team directly (via email or telephone) if interested in participating. The interviews were conducted by experienced interviewers (JCM/TC) using an interview schedule (supplementary file 1).

Main outcome measures

Attitude towards self-harm in CYP was measured using a 13-item self-report questionnaire.[20] The scale captures three factors of attitude: (1) 'effectiveness' (which is defined as a sense of personal effectiveness in managing self-harm); (2) 'negativity' which is defined as negativity expressed towards patient or family; and (3) 'worry' which is defined as concerns about being blamed or feeling personally responsible for these patients.[20] Each item is rated on a Likert Scale from 0 to 3 with higher scores indicating more positive attitudes.

Knowledge of self-harm in CYP was measured through an adapted 12-item, self-report questionnaire.[20] Each item was rated as *true*, *false* or *don't know*. Responses were recoded as *correct* or *incorrect* and scored as 1 and 0, respectively; higher scores indicate increased knowledge.

Confidence was measured through Likert Scale responses to seven statements relating to confidence in different areas of practice. The statements and associated Likert Scales were developed specifically for this study. The Likert Scales have points ranging from strongly disagree to strongly agree (agreement with the statements is considered as positive).

Self-efficacy for working with CYP who have self-harmed was measured through an adapted version of the Self-efficacy Towards Helping Scale.[21] This is a 10-item self-report scale yielding a total score of self-efficacy with higher scores indicating increased self-efficacy.

Clinical behavioural intention was measured by the Continuing Professional Development Reaction Questionnaire[22] which is a 12-item, self-report questionnaire yielding five constructs relating to clinical behavioural intention. The five constructs are: Intention; Beliefs about capabilities; Beliefs about consequences; Social influences; and Moral norm. Cronbach's α for the five constructs was within the acceptable range and varied from 0.77 to 0.85.

These outcome measures were compiled into a self-reported online questionnaire (supplementary file 2) prefaced with questions pertaining to participant characteristics and demographic information.

Analysis

Quantitative analysis

Summary demographics and characteristics of the sample were initially described. Baseline and postintervention outcome data were described using means and SD when normally distributed and medians and IQRs when non-normally distributed.

To compare baseline and postintervention data scores, differences in continuous data were analysed using t-tests or Wilcoxon signed rank tests as appropriate. An analysis of change in percentages of agreement to each of the individual confidence statements was undertaken using McNemar's test and ORs calculated. Statistical significance was assessed at the 5% (two-sided) level. Cohen's d effect sizes (parametrical) and Rosenthal's effect sizes (non-parametrical) were calculated for statistically significant results. All statistical analyses were conducted using SPSS (V.22).

Sensitivity analysis

Sensitivity analysis was conducted with only those who reported completing the intervention to determine whether this had an impact on the direction, size and statistical significance of the effect. Sensitivity analysis was undertaken for all outcomes, with the exception of the individual confidence scales.

Qualitative analysis

Recorded audio data were directly imported into NVivo V.10 for analysis and to keep an audit trail of the analytical process. Data were initially coded by one researcher using a data-driven approach. These codes were then reviewed and discussed with a second researcher. Data saturation was determined when no new codes could be generated from the data. Once data saturation had been established, codes were refined, developed and grouped into themes by two researchers. The principle of constant comparison was used to test and refine the empirical conceptual consistency of codes and themes which were synthesised and then narrated.[23]

RESULTS

Quantitative results

Recruitment and follow-up

Ninety-eight participants were recruited (response rate=39%) from a pool of 251 registered children's nurses. The mean age of participants was 33 years (SD=10), the majority were female (n=93, 95%) and singularly qualified as registered children's nurses (n=94, 83%). Participants' level of education ranged from diploma to master's level with 45% (n=44) of nurses educated to degree level. The participants had various years of postqualification practice (range (years)=1–38) with a median length of time in their current role of 3 years (IQR=5). The majority of participants stated they had previously been involved in the care of a CYP who had self-harmed (n=94, 96%) and approximately three quarters of the sample (75%, n=73) stated they had never received previous training in caring for CYP who have self-harmed. For an overview of the sample characteristics, see table 1.

Table 1 Characteristics of st participants

Mean age in years (SD)	33.2 (10.0)
Gender (%)	
Male	1 (1)
Female	93 (95)
Not specified	4 (4)
Median* years in current job (IQR†)	3 (5.0)
Highest educational level (%)	
Diploma	24 (24)
Degree	44 (45)
Postgraduate certificate	7 (7)
Masters	21 (22)
Not specified	2 (2)
Agenda for change banding (%)	
Band 5	52 (53)
Band 6	20 (20)
Band 7	22 (23)
Band 8a	1 (1)
Not specified	3 (3)
Previous training for caring for CYP with self-harm (%)	
Yes	17 (17)
No	73 (75)
Don't know/can't remember	8 (8)

*Median calculated due to non-normal distribution.
†IQR.
CYP, children and young people.

All participants were sent the postintervention questionnaire. At follow-up, 51 (52%) participants completed the postintervention questionnaire, with 33 (65% of those followed up) reported completing the digital educational intervention.

Attitudes towards CYP who self-harm

There was an improvement in attitudes from preintervention to postintervention on the Effectiveness factor (see table 2). No statistically significant differences were observed on the Negativity or Worry factors. Sensitivity analysis of only those who completed the intervention showed an increased improvement in attitude on the Effectiveness factor and increased effect size, which retained statistical significance. An increased, positive improvement in attitude was also observed on the factors of Negativity and Worry. However these changes remained statistically non-significant.

Table 2 Precomparison/postcomparison of attitude subscales of total sample (n=51) and intervention completers only (n=33)

Factor of attitude scale	Sample	Preintervention mean (SD)	Postintervention mean (SD)	Difference in means (95% CI)	P value*	Effect size (Cohen's d)
Effectiveness	Total (n=51)	10.40 (2.17)	11.08 (1.56)	0.82 (0.09 to 1.55)	0.03†	0.31
Negativity	Total (n=51)	12.07 (1.91)	12.57 (1.77)	0.61 (-0.23 to 1.45)	0.15	–
Worry	Total (n=51)	5.50 (1.34)	5.40 (1.31)	–0.10 (-0.59 to 0.40)	0.69	–
Effectiveness	Intervention completers only (n=33)	9.88 (2.23)	11.12 (1.69)	1.24 (0.35 to 2.13)	0.008**	0.49
Negativity	Intervention completers only (n=33)	11.79 (2.04)	12.67 (1.57)	0.87 (-0.05 to 1.81)	0.06	–
Worry	Intervention completers only (n=33)	5.57 (1.39)	5.60 (1.34)	0.03 (-0.58 to 0.64)	0.92	–

*Calculated through paired samples t- test.
†Statistically significant at 0.05 level.

Self-efficacy towards CYP who self-harm

A statistically significant reduction in self-efficacy (negative effect) was observed postintervention for analysis conducted on all respondents including those that did not complete the digital educational intervention (see table 3). When sensitivity analysis of only those who completed the intervention was conducted the difference (negative effect) no longer retained statistical significance.

Knowledge of self-harm in CYP

A statistically significant increase in knowledge was observed postintervention (see table 3). Statistical significance was retained in the sensitivity analysis of only those who completed the intervention as an increased effect size was observed.

Confidence of caring for CYP who self-harm

Analysis compared preintervention and postintervention agreement with positive statements reflecting confidence in different areas of practice. There were positive changes (increased frequency of people agreeing with the statements) in six of the seven statements, with statistically significant improvement of response to three statements related to: perceived ability to care for a child; perceived ability to communicate with parents; and perceived ability to not make things worse (see table 4).

Clinical behavioural intention: adopting a collaborative working style with CYP who self-harm

There was a statistically significant increase in the median score from preintervention to postintervention on the subscale relating to belief about the negative consequences of not collaborating with CYP who self-harm (see table 5). No statistically significant differences were observed on the remaining four subscales. Sensitivity analysis revealed statistically significant improvements on three of the five subscales: moral norm (feeling of personal obligation regarding the adoption of the collaborating with CYP who self-harm); beliefs in capabilities about collaborating with CYP who self-harm; and belief about the consequences of not collaborating with CYP who self-harm.

Qualitative findings

Recruitment and participants

All 33 participants that completed the digital educational intervention were invited to participate in the qualitative interviews. Eight registered children's nurses consented to participate, representing 24% of completers. All participants were female, worked in either general medical, paediatric critical care, medical short stay or 'other' clinical areas, their seniority ranged from band 5 to band 7 on the NHS agenda for change banding, and years since qualifying ranged from 1 year to 29 years (median 5 years). Interviews were conducted by two researchers (JCM and TC) at a time and location convenient for the participant. Five interviews were conducted face-to-face and three by telephone.

Table 3 Precomparison/post-comparison of continuous variables of the total sample (n=51) and intervention completers only (n=33)

Variable	Sample	Preintervention mean (SD)	Postintervention mean (SD)	Difference in means (95% CI)	P value†	Effect size (Cohen's d)
Self-–efficacy towards helping CYP who self-harm	Total (n=51)	28.9 (3.6)	27.6 (2.37)	–1.25 (-2.46to 0.05)	0.042*	0.29
Knowledge of self-harm in CYP	Total (n=51)	7 (2.53)	7.96 (2.4)	1.12 (0.25 to 1.99)	0.013*	0.36
Self-efficacy towards helping CYP who self-harm	Intervention completers only (n=33)	28.81 (3.69)	27.45 (2.61)	–1.36 (-2.89 to 0.17)	0.079	-
Knowledge of self-harm in CYP	Intervention completers only (n=33)	6.69 (2.95)	8.67 (1.96)	1.97 (0.95 to 2.99)	0.000**	0.69

*Statistically significant at 0.05 level.
**Statistically significant at 0.001 level.
†Calculated through a paired sample t-test.
CYP, children and young people.

The eight interviews yielded 121 min of audio data (range: 9.1–21.1 min; median: 14.6 min). Initial coding of the data (conducted by JCM) resulted in 160 codes. Data saturation was determined through discussion with the second researcher (TC) when no new codes were developed. From the 160 codes, four categories were developed through collapsing and refining (conducted by JCM and TC) that included: (1) motivation to access the programme; (2) Accessibility and acceptability of interfacing with the programme; (3) Impact of the programme; (4) The next steps, and which will now be discussed in turn.

Motivation to access the programme

Lack of perceived capability in caring for CYP admitted with self-harm was reported by the majority of informants as a key motivator to access the digital educational intervention. Specifically, participants reported fears of making things worse or saying the wrong thing, having a lack of exposure, experiencing challenges of communicating with CYP, and others being more capable as key motivators to engage with the programme.

'…we are all quite scared of it [caring for CYP with self-harm] we don't want to say the wrong thing and make the

Table 4 Response change from preintervention to postintervention on confidence Likert Scale statements

Likert Scale statement	Preintervention percentage of agreement †	Postintervention percentage of agreement †	p Value‡	OR
I have the ability to care for a child or young person who has self-harmed	49%	78%	0.000**	2.18
I am able to communicate effectively with a child or young person who has self-harmed	56%	76%	0.06	
I am able to communicate effectively with a parent/carer of a child or young person who has self-harmed	64%	86%	0.02*	0.24
I am confident that I will not make things worse for a child or young person in my care who has self-harmed	45%	68%	0.04*	1.65
I am able to provide information on a child or young person who has self-harmed to a child and adolescent mental health service (CAMHS) worker	82%	94%	0.34	
I am able to remain calm when caring for a child or young person who has self-harmed∞	94%	92%	-	
I am able to comfort a child or young person in my care who has self-harmed	81%	86%	0.63	

*Statistically significant at 0.05 level.
**Statistically significant at 0.01 level.
†Calculated through McNemar's test.
‡Percentage of participants stating they either 'agree' or 'strongly agree' with the statement.
∞Unable to calculate probability due to insufficient cases within cells.

Table 5 Precomparison/postcomparison of continuing professional development (CPD) reaction questionnaire subscales for total sample (n=51) and intervention completers only (n=33)

Subscale	Sample	Preintervention median (IQR)	Postintervention median (IQR)	P value†	Effect size (r)
Intention	Total (n=51)	6.5 (1.5)	6.0 (1.5)	0.69	
Social influence	Total (n=51)	5.53 (1.43)	5.53 (1.47)	0.48	
Beliefs about capabilities	Total (n=51)	5.67 (1.33)	5.67 (1.33)	0.08	
Moral norm	Total (n=51)	6.5 (1.0)	7.0 (1.0)	0.14	
Beliefs about consequences	Total (n=51)	6.5 (2.0)	6.5 (1.0)	0.04*	0.29
Intention	Intervention completers only (n=33)	6.0 (2.0)	6.0 (3.0)	0.09	
Social influence	Intervention completers only (n=33)	5.53 (1.77)	5.86 (1.27)	0.07	
Beliefs about capabilities	Intervention completers only (n=33)	5.67 (2.0)	6.0 (2.67)	0.01*	0.42
Moral norm	Intervention completers only (n=33)	6.0 (1.75)	7.0 (1.0)	0.01*	0.43
Beliefs about consequences	Intervention completers only (n=33)	6.0 (2.0)	6.5 (1.0)	0.00**	0.49

*Statistically significant at 0.05 level.
**Statistically significant at 0.01 level.
†Calculated through Wilcoxon signed ranks test.

situation worse and for the majority of people it is the fear of making the situation worse and that's why people don't talk about it…' (N4, 2:26.2–3:03.3)

Interestingly, a minority of participants reported they had the experience and skill set to effectively care for CYP who had self-harmed. However, their motivation to access the resource was centred on increasing their confidence alongside refreshing and updating their knowledge to ensure their fundamental understanding of caring for CYP who have self-harmed was appropriate. Participants reported that no training programme or resource currently existed and therefore hoped that the digital educational intervention would address their concerns and raise their awareness of the core areas to focus their interaction and care.

'…I guess approaching the patients I find difficult as I haven't had that much experience with it, and obviously the newly qualifieds go out onto the wards and have to deal with these patients, want advice on them, to do with the safeguarding, CAMHS and all that and I do not have that much information and I don't feel confident in teaching or guiding them with that sort of thing so I guess that's why.' (N3, 1:34.0–2:14.0)

An awareness of inequality of care provided to CYP who have self-harmed also featured in participants' motivations for engaging with the educational programme. A number of participants reflected on their observations of practice and recognised the substandard care being delivered to CYP admitted following self-harm. This was associated with their own and other people's misconceptions and stigmatising behaviours. Participants identified that through engaging with the education intervention it could be used as a tool to empower and challenge themselves and others.

Accessibility and acceptability of interfacing with the programme

Irrespective of seniority, clinical area or experience, all participants responded extremely positively to the content of the digital educational intervention. Participants reported that the focus was appropriate; covering pertinent topics, with the right amount of the information, delivered at the right level. All participants identified that e-learning was an acceptable mode of delivering the educational intervention, with the majority stating that the programme was professional and well constructed. Participants reported that they worked through the digital educational intervention sequentially, acknowledging that they valued that the learning was broken into manageable modules. Participants reported that they valued the variety of ways in which the information was delivered, which was associated with keeping their interest and assisting in their knowledge retention. The videos discussed frequently within the interviews and identified as being particularly useful in engaging the participants, as they were reported to be powerful, emotive, interactive, have fidelity and get the message across simply.

The experiences and logistics of accessing the digital educational intervention varied among respondents' reports. Half of participants identified that it was difficult to access the digital educational intervention at work due to other demands on their time. Subsequently, a number

of participants reported accessing the digital educational intervention on night shifts which they recognised may have affected their ability to retain the information. In contrast, other participants reported that they found the digital educational intervention easy to access at work but recognised that a quiet environment was essential to enable them to focus and immerse themselves in the programme.

Impact of the programme

All participants reported improvements to their practice, as well as reflections on their practice, as a direct result of engaging with the digital educational intervention. The improvements related to: skill development; improved confidence and empowerment; changes to approach of caring for CYP; greater levels of knowledge; and recognising an improved ability to effectively communicate.

A number of participants reported learning new skills, such as how to meaningfully engage and communicate with CYP;however, others reported a building of existing skills. Participants reported that skill acquisition was facilitated by examples of poor and good practice as well as the summaries of strategies that could be implemented.

> *'…I have sort of put them [skills acquired] into practice more with the parents of families in the area where I do work. Because obviously that is very important as well and they are feeling very scared and very vulnerable so it is not necessary about deliberate self-harm but it is more about building a relationship where they feel they can express how they feel to you and they feel that it is a non-judgemental space.…So I have used it on families and it has changed me to think just a bit deeper about how they might be feeling themselves because you know it is their child' (N1, 8:10.0–9:06.0)*

Participants reported they felt more empowered to act and respond to CYP with self-harm. This was especially evident for those informants who did not routinely engage with CYP who self-harm. Improved confidence was reported by all informants that related to their own practice and in challenging and supporting others to care.

> *'…I feel I have got the skills to do it [caring for CYP with self-harm] as I am a very experienced nurse, but I felt more confident after doing the e-learning…I still think before I did that I would have shied away from it a little bit more, if there was somebody else there then I would have thought they know more than me. It was the e-learning that gave me the confidence to be more open and not worry if someone said 'I have been self-harming'…' (N8, 5:30.0–6:38.0)*

Interviewees reported that through undertaking the digital educational intervention changes had been made to their practice and alluded to a focus on holistic approach. The majority of informants reported greater confidence and ability in engaging with CYP, identifying being open, honest and collaborative. Participant accounts included a positive and active approach to caring for CYP with self-harm. Informants reported being proactive in engaging and supporting CYP to disclose, and appreciated that they were not going to cause harm by communicating with CYP.

> *'We cannot just work with these children in isolation, there are so many people that are involved at the point of admission, right the way through, and then beyond discharge… you need to involve everyone, all agencies. And you cannot communicate too much, keeping people up to date, even if someone has communicated that information, at least you can reiterate it, it's a lot worse if things get missed and don't get passed on.' (N7, 3:35.0–4:30.0)*

It was evident from all participant interviews that through completing the digital educational intervention reflections were provoked, with patient narratives and experiences being identified as the most powerful and provocative content. Subsequent reflections appeared to focus on two areas which included practice and wider contexts. Participants reported that engaging with the digital educational intervention provoked re-evaluation of own practice. Informants identified that through the content and activities within the programme it could be used as a tool for reflection. Generally participants identified that the digital educational intervention was thought-provoking. Some informants identified that it challenged their existing views and triggered greater awareness of their own conduct and the impact on others.

> *'…I think there is a risk with self-harm that people have preconceived ideas and views and I felt that this [the digital educational intervention] actually challenged some of that and make people think a bit differently…I think what is does do is refocus doesn't it and makes you think of these young people and perhaps makes you think of them in a little more compassion next time you bump into them. But as I say in our day to day practice we regularly find people that have self-harmed and it reminds you of the frustration in trying to get access to the right people to help them.' (N6, 1:43.0–1:56.0)*

The next steps

Overall participants reported that the digital educational intervention did not require any modification or improvement. However, a minority of respondents identified that the learning experience would be improved by: including health professional views or videos to capture another perspective; including subtitles on the videos; having more interactive activities; including an element of peer support such as learning through an online community which could be embedded into the programme.

Overwhelmingly, participants identified that the digital educational intervention would be useful for all people working with CYP irrespective of field of practice (eg, education, health, social care). However, for disseminating and implementing the digital educational intervention within healthcare it was reported that this should be targeted at all front-line staff, not only nurses. In addition, a number of respondents identified that the digital educational intervention may be particularly useful for newly qualified staff

and would be an appropriate component of an induction programme. However, across participant's accounts it was identified that the digital educational intervention would be most effective if it was part of a combined programme which could include face-to-face group training allowing for skill practice and reflection.

DISCUSSION

Despite growing numbers of CYP being admitted to hospital with self-harm,[24] until now there has been no specific, empirical research that has explored the attitudes, knowledge and confidence of registered children's nurses who provide care for CYP admitted with self-harm in acute paediatric inpatient care. The digital educational intervention was implemented and evaluated with registered children's nurses at a single site, using a mixed-methods, quasi-experimental design. Overall, for those who completed the intervention, improvements (moderate effect sizes) were observed in knowledge and attitudes. This observation is consistent with previous synthesised findings of the effectiveness of educational interventions for healthcare staff working with people who have self-harmed.[12] In addition, this study also found improvements in confidence and clinical behavioural intention. This has not previously been measured as an outcome of training in this context so no comparison can be made. However, in line with the theory of planned behaviour[25] it can been posited that the intervention may likely lead to behavioural change and consequently influence nurses' practice. This is supported by qualitative findings from this study indicating nurses experienced: skill development; feelings of empowerment and improved confidence; being more knowledgeable; being able to effectively communicate; reflecting on their own practice; and consideration of CYP emotional health and well-being in a broader context. Saying that, it is important to recognise that behavioural change was not measured as part of this study. Therefore to establish the impact of this intervention on behavioural change, future empirical research is required.

Our findings suggest that e-learning that is developed using a participatory, user-centred approach and is underpinned by learning design experts[26] is an appropriate and acceptable method of delivering training on skills, knowledge, approaches to care, as well as motivating meaningful reflection on the care of CYP who have self-harmed. Previous research using a similar approach involving stakeholder co-design of reusable learning objects in healthcare interventions have also proved successful in increasing knowledge and skills.[27] The participatory approach based on a validated development methodology allows user perspectives and experiences to be incorporated into the e-learning.[28] Although this approach is labour-intensive, the e-learning is more aligned to users' needs leading to greater acceptability and reuse.[29]

Strengths and limitations of the study

The validity of the findings is supported by the sample—approximately 40% of all the registered children's nurses working within the study site. Moreover, the sample consists of nurses from a broad range of agenda for change bandings; years since qualification; level of educational achievement; and clinical roles. Despite positive implications, the findings from this study need to be considered with caution. The sample was recruited from a single site and therefore may not be reflective of the wider population of registered children's nurses working in acute paediatric inpatient care.

However, the sample did reflect over a third of the total number of registered children's nurses at the site and this is likely to be representative of the knowledge, attitudes and confidence of nurses at this site. Additionally, the lack of a control condition limits the ability to make strong claims regarding causation. However, sensitivity analysis suggests that those who completed the intervention improved to a greater extent across all outcomes and across more domains compared with equivalent analysis of the full sample. Therefore suggesting improvements in outcomes was associated with intervention engagement.

A further limitation of this study is the lack of data being collected pertaining to the actual behavioural measures relating to CYP outcomes. It is therefore not known if the apparent changes in knowledge, attitudes and confidence led to actual changes in behaviour towards patients and their outcomes of care.

Implications for clinicians and policy makers

In the current national context there is a drive for person-centred, cost-effective and sustainable approaches to educating the healthcare workforce to enable the delivery of high quality care for all. While recognising the limitations of this study, it is evident that a co-produced educational intervention delivered via a digital platform has the potential to improve knowledge, confidence, attitudes and clinical behavioural intentions of health professionals when caring for CYP admitted with self-harm. Use of underpinning theory for e-learning design coupled with a validated participatory development methodology is an important factor in ensuring acceptability and reuse. Considering the complex nature of self-harm, there is scope for similar digital interventions to be developed for staff who provide care for other complex and often misunderstood or stigmatising conditions.

CONCLUSION

Initial evidence of the effect of the digital educational intervention is promising and demonstrates the potential this intervention has in improving knowledge, confidence and attitudes of registered children's nurses. However, before substantial claims regarding efficacy can be made, multisite evaluation is required via a randomised control trial to test the extent to which the intervention is truly effective. Additional outcome

measures need to include patient reported measures relating to care experience and outcome.

Findings indicate there is scope to adapt the intervention to other populations who are involved in the care of CYP, such as parents and education professionals. However, such adaptions would need to be appropriately evaluated to assess acceptability and impact for the specific population prior to wider implementation.

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