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The effect of a training programme on school nurses' knowledge, attitudes, and depression recognition skills: The QUEST cluster randomised controlled trial.

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Abstract

Background

Mental health problems in children and young people are a vital public health issue. Only 25% of British school children with diagnosed mental health problems have specialist mental health services contact; front-line staff such as school nurses play a vital role in identifying and managing these problems, and accessing additional services for children, but there appears limited specific training and support for this aspect of their role.

Objectives

To evaluate the effectiveness of a bespoke short training programme, which incorporated interactive and didactic teaching with printed and electronic resources. Hypothesized outcomes were improvements in school nurses' knowledge, attitudes, and recognition skills for depression.

Design

A cluster-randomised controlled trial.

Participants and setting

146 school nurses from 13 Primary Care Trusts (PCTs) in London were randomly allocated to receive the training programme.

Methods School nurses from 7 PCTs (n=81) were randomly allocated to receive the training intervention and from 6 PCTs (n=65) for waiting list control. Depression detection was measured by response to vignettes, attitudes measured with the Depression Attitude Questionnaire, and knowledge by the QUEST knowledge measure. These outcomes were measured at baseline and (following training) 3 months and nine months later, after which nurses in the control group received the training programme.

Results At 3 months, 115 nurses completed outcome measures. Training was associated with significant improvements in the specificity of depression judgements (52.0% for the intervention group and 47.2% for the control group, P=0.039), and there was a non-significant increase in sensitivity (64.5% compared to 61.5% P=0.25). Nurses' knowledge about depression improved (standardised mean difference = 0.97 [95% CI 0.58 to 1.35], P<0.001); and confidence about their professional role in relation to depression increased. There was also a significant change in optimism about depression outcomes, but no change in tendency to defer depression management to specialists. At 9-month follow-up, improved specificity in depression identification and improved knowledge were maintained.

Conclusions

This school nurse development programme, designed to convey best practice for the identification and care of depression, delivered significant improvements in some aspects of depression recognition and understanding, and was associated with increased confidence in working with young people experiencing mental health problems.

Keywords
Attitude; Depression; Education, Professional; Knowledge; Mental Health; Nurses, Public Health

Contribution of the Paper.

What is already known about the topic?

- Mental health problems affect one in ten young people, and these problems have substantial impacts on achievement and wellbeing in adulthood.
- Specialist services intervene with only a minority of young people with mental health problems, and there is an urgent need to enhance the involvement of front-line professionals such as school nurses in problem recognition and management.
- Systematic reviews indicate that universal and targeted health promotion interventions are effective for a range of mental health, social and educational outcomes, and that such interventions can be delivered and facilitated by routine staff (such as teachers) rather than clinical specialists.

What this paper adds

- A brief, multifaceted educational programme for school nurses was developed on the basis of review and consultation with stakeholder groups including a survey and focus groups.
- Our evaluation showed that this educational intervention was associated with some positive improvements in school nurses' attitudes to depression and its management, increases in their knowledge, and improvement in their ability to differentiate depression from other problems that young people experience.
- Because of the design and methods used, this evidence that brief training can enhance aspects of attitudes, knowledge and problem detection appears robust and generalisable.

Background

The mental health of children and young people is a fundamental part of their overall quality of life, strongly influencing their current and future wellbeing and life chances. This is explicitly recognized by the Convention on the Rights of the Child (UN General Assembly 1989), and a raft of policy initiatives in the United Kingdom (UK) (Department of Health 2015, Public Health England and The Children and Young People's Mental Health Coalition 2015), Europe (Braddick *et al.* 2009), the USA (AACAP 2009), and elsewhere (Currie *et al.* 2012).

Many mental health problems commence in early life: a systematic review of studies incorporating standardised diagnostic assessments indicates a world-wide pooled prevalence of 13.4% among children and adolescents (Polanczyk *et al.* 2015). Anxiety and depressive disorders make up around half of this (Green *et al.* 2005). These problems are associated with social and educational under-achievement (Esch *et al.* 2014), higher rates of smoking and substance misuse (Davis *et al.* 2008), increased risks of teenage pregnancy (Mollborn & Morningstar 2009), of self-harm, and of suicidal ideas and completed suicide (Mars *et al.* 2014, Goldman-Mellor *et al.* 2014).

Psychological problems in young people frequently persist into adulthood. Population based epidemiological studies of lifetime and initial occurrence of mental health problems in the USA (Kessler *et al.* 2007) and cohort and follow-up studies the UK (Kim-Cohen *et al.* 2003, Ford *et al.* 2017) show extensive problem persistence; half of those people with lifetime problems experience initial symptoms by the mid-teenage years, and (excluding dementia) three-quarters of mental health problems in adult life start by the mid-20s. Prospective British cohort data over a 50-year follow-up period provides powerful evidence of long-term impacts among those affected by childhood psychological problems: by age 50, adult family incomes

are reduced by 28%, the probability of working is 11% lower, and there are consistent reductions in memory, emotional stability and personality components of agreeableness and conscientiousness (Goodman *et al.* 2011).

There is widespread stigma associated with mental health problems, and for this reason together with heterogeneity of presentation, a large proportion of young people with mental health problems are not identified and offered evidence-based support and treatment. Among all age groups, people may have uncertainties and fears about depression and its treatment, but these difficulties may be particularly relevant to young people, resulting in low levels of help-seeking from mental health professionals (Gulliver *et al.* 2010) as well as from non-professional supports (Biddle *et al.* 2004). Health professionals experience difficulty in accurately recognising depression in all age groups, with a systematic review indicating that around half of people presenting with depression are not correctly identified by nurses (Mitchell & Kakkadasam 2011). The life stage transitions characteristic of adolescence may influence health professionals' recognition of depression in this age group, with clinical features possibly interpreted as transient responses to life problems or teenage angst (Patton *et al.* 2014).The ability of health professionals to identify depression is affected by these factors, as well as by their confidence in their own skills and in the available treatment and support approaches (Haddad *et al.* 2009).

This is important as unrecognised problems indicate missed opportunities to intervene to interrupt the trajectories associated with long-term negative outcomes (de Girolamo *et al.* 2012). There appear to be widespread delays between the emergence of psychological problems and treatment contacts, with World Health Organisation (WHO) World Mental Health survey findings indicating that within high-income nations, where services are most available and accessible, the median treatment delay is between 10 and 28 years for anxiety disorders, and between 1 and 4 years for mood disorders (Wang *et al.* 2007). Studies in the UK indicate similarly low rates of specialist service contact, with only 25% of young people with clinically impairing problems in contact with specialist mental health services, though twice as many in contact with primary health care professionals and teachers (Ford *et al.* 2007). The impact of mental health problems together with the extent of unmet need underline the importance of all professionals working with children, particularly those within universal children's health services and primary health care, having key skills in identifying and managing common difficulties, together with knowledge about how to access more specialised services for those children they cannot manage themselves (Ford *et al.* 2007).

Basing mental health promotion and prevention activities within school fits logically with their expanding role with greater focus on health and well-being (OECD 2014). School-based mental health initiatives include universal whole-school programmes, typically addressing areas such as problem solving, interpersonal skills, empathy, and coping with stress (Fazel *et al.* 2014, Sancassiani *et al.* 2015) to targeted or selective interventions addressing those judged to be at increased risk of developing problems or displaying subclinical symptoms. Findings from evaluation studies provide conflicting evidence: a review of the effectiveness of universal school-based health promotion showed positive effects of interventions for physical activity and healthy eating outcomes, tobacco use, and being bullied, but a lack of evidence for mental health benefits (Langford *et al.* 2014). However, a review that specifically focused on depression prevention programmes for children and young people found modest evidence that both universal and targeted interventions were effective, the authors concluding that schools remain one of the most promising sites for the delivery of programmes, and that universal roll-out has much to offer (Merry *et al.* 2011).

Providing front-line staff with the knowledge and skills to promote good emotional health and to deliver early interventions for children at risk of developing mental health problems has been widely advocated as an important part of addressing this issue (Hoge *et al.* 2009, EU Health Programme 2017). In the UK, the Department of Health ten-year strategic plan for

children's services (Department of Health, 2004) specified that that all staff working directly with children and young people should have sufficient knowledge, training, and support to promote psychological well-being and to identify early indicators of difficulty, and this key theme has been re-iterated and developed in successive review policy documents and clinical guidelines (NICE 2005, HM Treasury 2008, Department of Health 2008, NICE 2013).

In the UK, and several European countries, school nurses are registered nurses who typically hold a further postgraduate education in Specialist Community Public Health Nursing, whereas in the USA and Australia, school nurses do not necessarily hold specialist advanced practice qualifications. They are key providers of public health interventions for school-aged children, and are in an ideal position to deliver mental health promotion and prevention activities (Department of Health and Public Health England, 2014). They have been identified as having a key role in this work by their professional organisations in the USA (National Association of School Nurses 2013) and the UK (Royal College of Nursing 2017); and similarly, survey responses from 37 WHO European Region member states reveal that school nurses are the most common health provider in schools and that mental health and behavioural problems alongside life-style health related issues are priority areas for school health (WHO Regional Office for Europe 2010). Key aspects of the school nurse role centre on promoting health and emotional well-being, supporting those with emotional and mental health difficulties and referring to relevant agencies and services where appropriate. This support for children, young people, and families can enable early identification of mental health issues, provision of interventions, and assistance through partnerships with primary and secondary care colleagues and, where relevant, timely referral or signposting to specialist services to ensure problems do not escalate to crisis point (Department of Health 2012). Importantly, school nurses and teachers are the professionals most commonly approached by parents whose children have mental health problems (Ford *et al.* 2007). The need for mental health support may occur throughout this school-age population, but children with disabilities, those in care, and young carers, including those with family histories of mental health problems, are more vulnerable to difficulties and to poor health outcomes and school nurses may be particularly well-placed to provide support and identify the need for early help among this group.

In England, school nurses are the biggest workforce specifically trained and skilled to deliver public health for school-aged children; however, since 2013, the responsibility for commissioning public health services has transferred from health services to local government with and there has been a decline in the provision of school nursing services (a 14% reduction in full time equivalent [FTE] school nurses from 2013 to 2017 and a 22% FTE reduction since 2010) (NHS Digital 2017).

The QUEST Project

In order to extend understanding of school nurses' capacity and support needs for working with common mental health problems we set up a project called QUEST – improving school mental health: a **qu**ality improvement **e**valuation for **s**chool nurses and **t**eachers, which was supported by The Health Foundation's Engaging with Quality in Primary Care programme (http://www.health.org.uk/programmes/engaging-quality-primary-care).

To help determine the best approaches for enhancing school nurses' confidence and skills in managing common mental health problems, we conducted a UK-wide survey to examine their role, attitudes, and needs in relation to this area of practice (Haddad *et al.* 2010). This study indicated the extent of school nurses' involvement and commitment to mental health work with young people; 93% agreed that this was an integral part of their job, and for most (55%) this occupied more than a quarter of their work time. However, nearly half (46%) of respondents reporting having not received any post-registration training in mental health. School nurses' attitudes indicated a rejection of stigmatizing views of depression and strong acknowledgement of their role in providing support. They identified working with young

people who self-harm and recognizing and being better equipped to assist in managing depression and anxiety as key topics for staff development programmes. Focus groups that we conducted with school nurses based in two English cities in a separate study (Pryjmachuk *et al.* 2012) provided further detail, indicating that they valued involvement with the mental health of young people, and felt this was an important area of their practice, but that a lack of confidence and appropriate training together with extensive workloads were seen as the main obstacles to this area of practice. The importance of support from local specialist mental health teams was also emphasised.

Study aims and design

The QUEST study was designed as a cluster randomised controlled trial (RCT) of a specially developed educational programme. Our main hypotheses were that school nurses who had received QUEST training would show greater sensitivity (correct identification of cases: the true positive rate) and specificity (correct identification of non-cases: the true negative rate) for the recognition of depressive symptoms (using a vignette method) than a control group, and that the trained group would achieve higher knowledge scores and reveal a more positive attitude to depression than the control group. The primary outcome time-point was at three-months following baseline measurement, and a follow-up outcome time-point was at nine-months.

Ethics and funding

Ethical approval to conduct this study was obtained from a designated NRES Committee London (REC Reference No. 08/H0720/42). The study was supported by an Engaging with Quality in Primary Care grant awarded by The Health Foundation, an independent charity that supports health care practice and policy research.

All participants provided informed consent and took part on a voluntary basis and were not remunerated for their participation.

Methods

Project team and steering

A project team was established comprised of clinical academics in partnership with staff from the mental health charity Rethink Mental Illness, school nurse leads from the services of two boroughs in South West London, and a service user representative. A steering group was also formed to oversee the study, made up of key members of the three UK school nurse professional organisations (the Royal College of Nursing [RCN] School Nurses' Forum, Community Practitioners' and Health Visitors' Association [CPHVA], and School and Public Health Nurses' Association [SAPHNA]), as well academic and clinical experts, teaching staff, and senior representatives from the Department of Health, the Mental Health Foundation and the Charlie Waller Memorial Trust.

Intervention

Based on the findings of our survey and focus groups, together with discussions with a range of stakeholders including young people, mental health charity/user group representatives, and professional organisations leads (RCN, SAPHNA, and CPHVA), we clarified educational needs and related considerations about mode, duration and feasibility. In line with models of behaviour change, we sought to involve school nurses as credible opinion leaders in the development of the training materials, and identified and accessed these nurses through engagement with local and national professional organisations and services (Greenhalgh *et al.* 2004, Prior *et al.* 2008). A training programme and linked resources were developed based on identified needs together with evidence concerning effective approaches to enabling changes in clinician behaviour (Grimshaw *et al.* 2004, Lau *et al.* 2015). The aims of the programme were to enable more accurate identification of depression by school nurses, and to provide them with improved knowledge of available support and management for pupils who were identified as depressed or at risk of depression. The programme was designed to incorporate

aspects of clinician education and professional development most clearly associated with the uptake of clinical guidelines and consequent improvements in patient outcomes, combining education meetings using mixed interactive and didactic methods delivered during a single (whole day) session and a follow-up (half-day session provided 4-6 weeks later), with a resource package which included printed and audio-materials, including a disc with copies of all materials, addresses and links to relevant tools, guidelines, and support services. The package included summary detail and links to relevant National Institute for Health and Care Excellence (NICE) guidelines and protocols; health status and risk measures including the Moods and Feelings Questionnaire (Angold *et al.* 1995); and information materials for professionals, for young people and for family members. The training was delivered to groups of school nurses according to their service teams, which at the time of the study (2008-11) were Primary Care Trusts (PCTs): these were the statutory commissioning and health and social care providers, coterminous to London boroughs, and were abolished in 2013 and replaced by clinical commissioning groups (CCGs). The training sessions were delivered with an identical programme and resources by the same trainers (clinicians and service user), with group sizes of around 10 staff attending. Members of the locality specialist mental health team for each of the participating school nurse PCT groups were invited to attend and contribute to part of the training session.

Measures

We evaluated the effect of training by measures of attitudes, knowledge, and depression recognition. We used an existing measure of attitudes, the Depression Attitude Questionnaire (DAQ) (Botega *et al.* 1992), a 20-item attitude scale that has been used in studies involving general practitioners (GPs) and nurses in the UK and elsewhere (Haddad *et al.* 2012), including our survey of school nurses. In the DAQ, respondents denote the strength of their agreement or disagreement with statements concerning depression, with factor analysis indicating factors relating to optimistic or pessimistic views about the causes of depression and its responsiveness to treatment, confidence in managing depression as part of one's professional role, and views about whether depression requires specialist treatments and professionals. Psychometric testing of the DAQ in samples of GPs and nurses has indicated key common attitude factors and internal consistency values between 0.59 and 0.64 for the subscales and between 0.62 and 0.64 for the overall scale (Haddad *et al.* 2012).

Because there were no adequate existing measures for depression knowledge and detection we constructed a 24-item test concerning key features, risk factors, management, and referral indicators, and a series of 12 vignettes to evaluate skills in recognising its presenting features. The development of the QUEST measures for depression knowledge and detection are fully described in a previous publication (Haddad & Tylee 2013). In short, these were developed from a review of the literature including clinical guidelines for depression management, mental health literacy materials, and previously developed tests, together with a series of panel group consultations with a group (n = 21) comprised of school nurses, clinical academics, mental health charity staff, and a service user.

Four related content areas were covered by the knowledge question set: clinical features - presentation and symptoms (4); condition description (6); risk factors and predictors (7); management/treatments/referral criteria (5). Items were of multiple choice format with a total possible score of 22. The item difficulty index - the percentage of correct responses for each item, with higher values indicating greater ease - ranged between 0.19 to 0.89, with a mean level of 0.48 (Haddad & Tylee 2013).

Participants' accuracy of depression identification was measured using a vignette method. Twelve depression vignettes were constructed with the assistance of the project panel to portray either features suggestive of clinical depression or more ambiguous features of distress or adjustment problems (Haddad & Tylee 2013). The likelihood of the features in each of the vignettes representing clinical depression was judged on a four-point scale:

0 unlikely to be depressed

1 likely to have some mild features of depression
2 likely to have clinically significant features of depression
3 highly likely to be clinically depressed

Scores were converted to a dichotomous rating of non-depressed (0 or 1) or depressed (1 or 2). Five of the vignettes represented depression cases, and seven, although manifesting difficulties and distress, were non-cases. The judgement and scoring of 7 clinician experts enabled consensus about depression caseness: the extent of agreement for expert raters' identification of intended cases was 94%, whereas for non-cases, it was 86%. Additionally, the intra-class correlation between the caseness ratings of the different raters for the 12 vignettes was determined as 0.733 (95% CI 0.547 to 0.893; df = 11; P<0.001).

Pilot study

To examine the feasibility of recruitment procedures, the acceptability of the training package intervention, the time and capacity to complete the outcome measures, and the response characteristics of the outcome measures, a pilot study using a single group pre-test, post-test design was conducted involving the school nurses (n=26) of a single London PCT. This PCT was excluded from recruitment to the subsequent RCT.

Responses to the outcome measures and additional feedback derived from brief satisfaction questionnaires and semi-structured interviews enabled review and modification of the content and duration of the training, and changes to the wording and format of some aspects of measurement. In particular, the instructions for the vignette-based depression detection measures were altered. In the pilot study, participants were requested to rate each of the 12 cases on the likelihood of clinical depression, and were also asked to briefly note two key elements of the young person's presenting problem, to describe what additional information would help the assessment, and to note two key elements of a resulting management plan. This was found to be too laborious and provided data which were not directly relevant to the key study aims, so the vignette instructions were reduced to only a depression status judgment using a four-point scale. The format and delivery of the pilot training was found to be appropriate to the participating staff needs and was well-received; responses to the pilot delivery clarified the importance of involving the local mental health team for part of the session and the interval to the half-day follow-up.

Sample size calculation

Sample size calculation was based upon the primary objective (significant improvement in case detection by school nurses). A systematic review of the routine clinical accuracy of practice and community nurses' depression identification found reported sensitivity to range between 16% and 37%, with a pooled value of 26% (Mitchell & Kakkadasam 2011). The limited studies of the effects of clinician training on depression identification indicate potentially substantial improvements (Gledhill *et al.* 2003, Eisses *et al.* 2005, Kramer *et al.* 2013). Based on these sources we estimated staff sensitivity of depression detection to be 20%, increasing to 50% post-training, which indicated that 39 participants were needed in each group. This would have 80% power to detect this expected difference in recognition at 5% significance level. Allowing for a cluster design correction based on the findings of the Hampshire Depression Project a cluster randomised controlled trial of an educational programme for GPs (Thompson *et al.* 2000), using a correlation of the sensitivity and specificity of detection ratings of 0.035, inflates the required sample to 50 in each arm with a minimum of 12 clusters needed. Allowing for a possible 25% staff dropout, 134 staff in total were needed.

Procedures: participant recruitment, intervention delivery, and measurement

Recruitment to the cluster RCT was from 30 of the 31 NHS London PCTs: school nursing services and teams were organised at PCT level and this was deemed the most appropriate way to structure the recruitment and random allocation, and to deliver the training

intervention – so PCTs were the clusters for this trial. Senior managers with responsibility for school health were contacted within each of these PCTs with information about the study and details of the extent of involvement required from school nurse participants.

As is usual in cluster trials, initial consent for individual school nurse's involvement was provided by relevant managers who were appropriate to make decisions on behalf of the entire cluster and to act as cluster gatekeepers. PCT school nurse teams were enrolled on a 'first-come first served' basis, based on a positive response from the relevant service manager to the invitation and a commitment support the involvement of at least half (and ideally all) of all employed school nurses to attend the training activities and complete the study measures. This cluster-level consent was provided for the school nurse teams of fifteen London PCTs, following which further enrolment to the trial was stopped. Two of these withdrew from the study prior to cluster allocation to the trial arms, leaving the school nurse teams of thirteen London PCTs (clusters) which were randomly allocated to the two study arms. Random allocation by cluster PCT was conducted by an independent researcher with clusters coded to ensure allocation was concealed from researchers and potential participants until the moment of assignment.

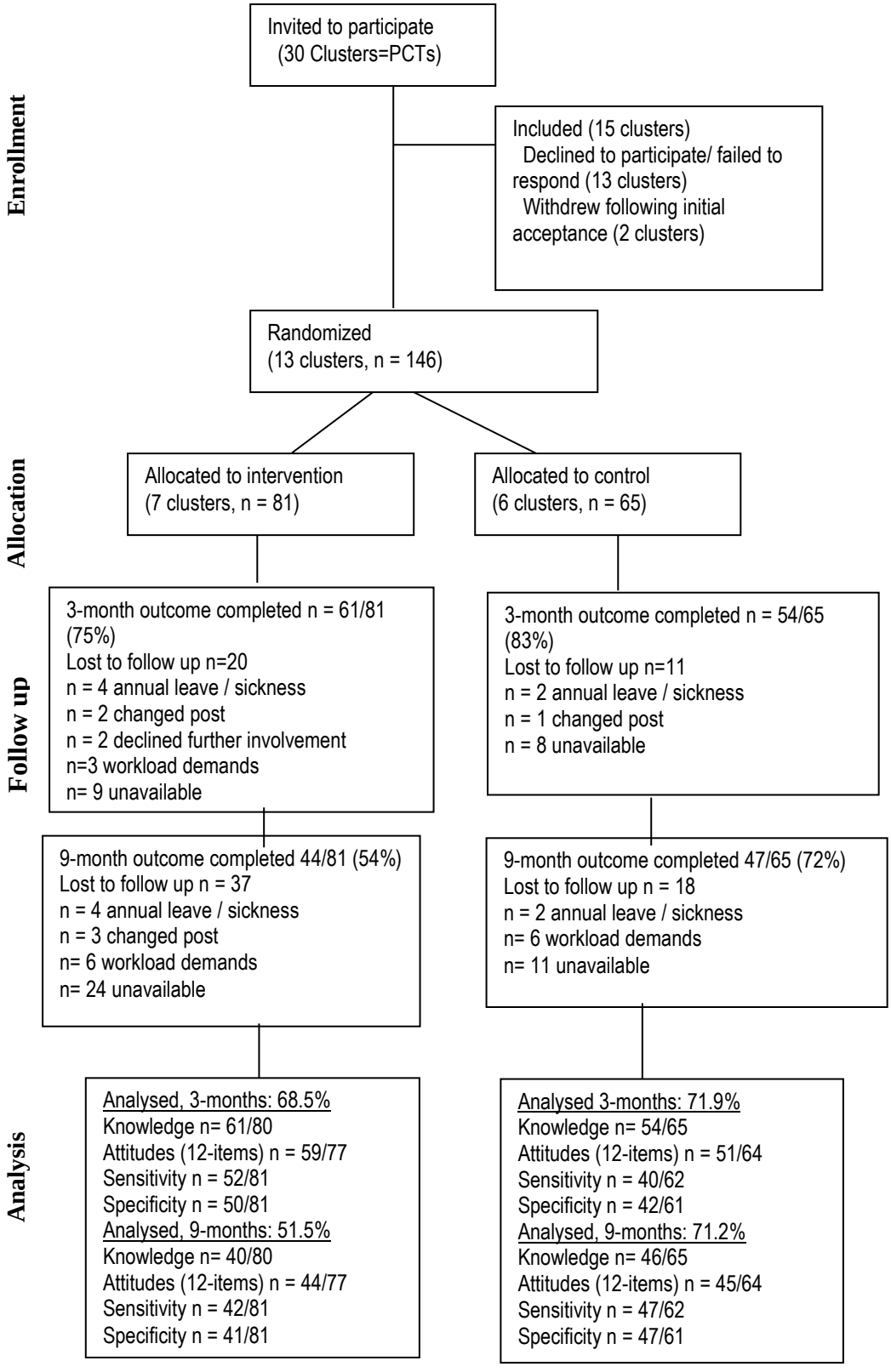
Individual informed consent was obtained from each available school nurses following cluster allocation. Training was provided to all available school nurses based within those PCTs randomly allocated to the study intervention arm; staff in the control arm PCT clusters received the training package at the end of the study, following measurement of all study endpoints. Researchers administered the outcome measures to both groups at the three time-points and ensured that all copies were collected to minimise the potential for checking, comparing and over-familiarisation with the measures.

Statistical analyses

Descriptive analyses were used to provide summary estimates of outcome measures. The size of intra-cluster correlation coefficient (ICC) for each of the outcome variables was identified by one-way ANOVA, where ICC = (F–1)/(F+m–1) and m the number of participants per cluster. A multi-level random-effects generalized least squares (GLS) model adjusted for clustering of school nurses within the participating PCTs was used to estimate at 3 and 9 months the between groups difference in knowledge and DAQ scores, and correct/incorrect depression detection in the twelve vignettes. For all analyses of intervention effect baseline values, specialist practitioner status and allocation were entered as predictors. SPSS™ 22.0 was used for the input and descriptive analysis of study data. Stata 13 (StataCorp LP) was used for the statistical analyses of the study data. Regression analyses took account of the clustered nature of the RCT with clustered standard errors also included to account for similarities in responses within clusters.

Sensitivity analyses to account for missing data were undertaken using intention to treat analysis, with the last observation carried forward from the baseline for participants with missing data.

CONSORT diagram showing the flow of participants through each stage of a randomized trial.



Results:
13 of the 30 eligible NHS London PCTs participated in the study. 146 participants were recruited from these13 PCTs, with between 4 and 18 school nurses from each PCT entering the study. These represented between 50% and 90% of the available school nurse workforce of these Trusts.

Random allocation by cluster PCT resulted in the available school nurse workforce of seven PCTs (81 school nurses) allocated to the intervention group (receipt of training package) and the school nurses of six PCTs (65 school nurses) to the control group (waiting list for receipt of training). 75 (51%) of the participants possessed the post-registration public health specialist practitioner qualification – 43 (53%) in the intervention group and 32 (49%) in the control group.

Overall, 70% of the 146 participants who were enrolled at baseline completed measures at the 3-month follow-up, with slightly higher retention within the control arm than the intervention arm. Measure completion was higher for the knowledge questionnaire than the detection vignettes, with overall completion derived from the mean of summed completion rates for the four areas of outcome measurement (knowledge - 18 items; attitudes – 12 items; sensitivity – 5 vignettes; specificity - 7 vignettes). At the nine-month follow-up, overall completion was 60% (52% in the intervention arm and 71% in the control arm).

Depression detection by vignettes
At baseline, the overall sensitivity based on the 5 vignettes devised to represent 'true cases' of depression was 66.3%, whereas overall specificity derived from the 7 vignettes that represented 'non-cases' of depression was 48.3%. The sensitivity of depression recognition varied between the trial clusters from 52% to 86.7%; specificity varied between clusters from 39.3% to 57.1%

There was no statistically significant difference between the trial clusters as determined using one-way ANOVA ($F_{12,130} = 1.237$, P = 0.265. The intra-cluster correlation coefficient of sensitivity ratings (baseline) was 0.013; whilst for specificity it was 0.004.

Following the training, no significant differences were evident between the intervention and control groups for sensitivity of depression recognition at either the three-month or nine-month follow-up. However, for participants' specificity ratings, there were significant differences between groups following the intervention at three-months (49.3% v 57.1%, P=0.039) and at nine-months (45.3% v 52.9%, P=0.001) (Table 1).

Knowledge
Mean (Standard Deviation) values at baseline between the trial clusters ranged from 8.29 (1.60) (cluster 9) to 11.73 (2.19) (cluster 1); the overall mean score was 10.46 (2.40). There was a statistically significant difference between the trial clusters as determined using one-way ANOVA ($F_{12,132} = 2.162$, P=0.021); though, a Tukey post-hoc test indicated that no particular between-cluster differences in knowledge test scores were statistically significant (Tukey HSD using harmonic mean sample size n=8.911; P=0.089). The intra-cluster correlation coefficient of knowledge scores (baseline) was 0.095.

Significant differences in knowledge scores between the trial groups were evident at the three-month and the nine-month time-points. The mean difference at three months was 2.80 (95% CI 1.73 to 3.87), P<0.001; this corresponds to a 12.7% difference on the knowledge measure, a large effect size $d = 0.97$ (95% C.I. 0.58 to 1.35) (Table 1).

For the three-month time-point, linear regression including trial allocation group, baseline knowledge score and specialist practitioner status as predictors indicated a significant effect of allocation to training (P=0.002 coefficient (β) for group effect =0 2.318). The overall model fit (R^2) was 0.331.

At nine-months the difference between the control and intervention groups reduced (β=1.75, 95% CI 2.94 to 0.56), but remained significant (P=0.001) (β for group effect = 1.354). The overall model fit (R^2) was 0.283, and the effect size was moderate: *d* = 0.64 (95% C.I. 0.20 to 1.07).

Table 1: Baseline, three-month and nine-month outcomes for QUEST trial participants

Outcomes			**Intervention**	**Control**	β	P-value
Knowledge baseline: mean (SD)			10.68 (2.48)	10.19 (2.30)	-	-
Knowledge 3 months: mean (SD)			12.85 (3.32)	10.01 (2.31)	2.318	0.002*
Knowledge 9 months: mean (SD)			12.25 (2.99)	10.50 (2.55)	1.354	0.001*
Attitudes: DAQ sub-scale: mean (SD)	**Professional confidence**	baseline	60.94 (15.11)	60.88 (16.44)	-	-
		3 months	67.86 (13.26)	60.25 (15.44)	7.207	0.004*
		9 months	63.67 (16.62)	60.09 (15.10)	3.289	0.335
	Defer to experts	baseline	32.07 (16.99)	30.19 (15.37)	-	-
		3 months	29.78 (16.04)	31.03 (19.11)	-3.833	0.240
		9 months	34.86 (17.48)	32.77 (17.50)	0.674	0.822
	Therapeutic optimism	baseline	67.23 (11.99)	66.85 (11.42)	-	-
		3 months	70.09 (11.47)	67.41 (12.78)	1.544	0.554
		9 months	69.49 (11.67)	64.26 (10.17)	4.372	0.003*
Sensitivity		baseline	64.20	69.03	-	-
		3 months	63.85	60.50	0.0613	0.250
		9 months	65.24	68.94	-0.0464	0.406
Specificity		baseline	47.09	49.88	-	-
		3 months	57.14	49.32	0.0895	0.039*
		9 months	51.92	45.29	0.0885	0.001*

For DAQ sub-scales, negative items are reversed so higher values indicate more positive attitudes.
P values and coefficients for allocation group effect from regression model controlling for clustered data with specialist practitioner status and baseline value as covariates.
*Statistically significant at P<0.05 level.

Attitudes

The mean baseline values (SD) of the DAQ subscales were similar for intervention and control participants: for professional confidence, 60.91 (15.66); for tendency to defer to experts, 68.76 (16.26); and for pessimistic view of depression, 32.94 (11.69).

There were significant differences between clusters at baseline for two of the DAQ sub-scales: professional confidence ($F_{12,132}$ = 3.374, P<0.001); and pessimism about depression ($F_{12,129}$) = 2.281, P=0.012). Tukey post-hoc tests indicated between-cluster differences in attitude scores were statistically significant for professional confidence in three clusters (3,4,7) and for pessimism in two clusters (2,5). For the summed 12 DAQ items included in the sub-scales, the intra-cluster correlation coefficient was 0.033.

The attitude factor concerning professional confidence improved post-training (60.94 to 67.86) whereas among the control group participants no improvement was evident (60.88 to 60.25) (Table 1). GLS regression analysis indicated a significant between groups difference controlling for baseline values and specialist practitioner status (β for group effect = 7.207; z=2.91). The overall model fit (R^2) was 0.478. At the nine-month follow-up, the difference

between groups in professional confidence had diminished and was no longer statistically significant (P=0.34).

There were no significant changes in the other DAQ attitude factors at the three-month outcome point. However, at the final nine-month time-point, the factor involving an optimistic or pessimistic view of depression and its response to treatment was significantly different between the groups (P=0.003) with the scores indicating a more positive view among the intervention group, whilst the control group ratings on these items had become slightly more negative.

Sensitivity Analyses

Results from regressions using last observation carried forward (LOCF) for missing data produced very little differences in the results above, though the coefficient for the effect of the intervention did reduce slightly. These findings highlight the results were non-substantially affected by missing data at follow-up.

Discussion

This study addressed an area of key public health importance, seeking to develop the skills of school nurses to more accurately and confidently identify depression among school pupils, and to equip them with improved knowledge of evidence-based approaches for the management of this condition. The findings showed the training programme we developed and implemented was associated with sustained improvements in participating school nurses' knowledge about depression and its management, and although the sensitivity of depression judgements was not influenced by the intervention, there were statistically significant and sustained improvements in the specificity of their judgements. The absence of change in sensitivity of depression identification did not appear (from examination of response distribution) related to ceiling effects in our devised vignette measures. However, it is possible that the sensitivity of depression recognition in this professional group was greater than in other generalist health professionals, as the value identified was higher than in studies of 'real recognition'; but unfortunately, our use of vignettes means this may not be a valid comparison. A higher level of correct recognition limits the potential for training to result in improvement in this measure, which may provide partial explanation of this null result, though it may be that our training was not sufficiently focused or expertly informed concerning this key aim. However, specificity was improved, and this is an important outcome: assisting school nurses in this aspect of differentiating between distress and probable clinical depression should result in reduced likelihood of inappropriate referral and intervention. There was also improvement in one key aspect of attitude, professional confidence, following training, though this was not sustained to the final follow-up point. Contrary to our expectations, the training did not have any effect on views about specialist compared to generalist care; however, optimism about depression and its response to treatment improved post-training and was significantly more positive at the nine-month time-point. It appears that our education about depression was successful in highlighting risks and consequences of depression whilst also emphasising potential for recovery and wellbeing.

Key strengths of this study were the extent to which the development of the training programme and linked materials was informed by consultation with the school nurse workforce (including a survey and focus groups) as well as by the involvement of stakeholders representing health professionals, mental health academics and service user organisations.

This evaluation involved a rigorous research design, using a cluster RCT to minimise the effects of bias and confounding to establish firm evidence about the effects of the depression training for school nurses. By using coding and an independent researcher, allocation was concealed, preventing selection bias and protecting the assignment sequence until allocation. Random allocation by geographical work-base clusters (PCTs) was designed to limit the

possibility of contamination effects – in this case the potential 'cross-talk' and sharing of teaching resources which would dilute any intervention effect. All available school nurses, and other first level and second level school nursing staff from the workforces of 13 London PCTs were invited to enter in this study, and participants comprised nearly 5% of the total school nurse workforce of England [there were 3000 full-time equivalent school nursing staff at the time of this study (NHS Digital 2017)]. The recruitment approach was designed to maximise the validity and generalisability of findings and the sample obtained met the pre-specified sample size target as well as being formed of adequate proportions of the total numbers of staff in each of the PCT clusters.

Our study had several important limitations. It was not feasible to conduct a study with measures of the effect of the depression education programme on real-world (i.e. using actual school pupils) clinical outcomes or true measures of depression recognition, management or referral. Although the outcomes that were examined used either validated measures or were developed using standardised procedures and reported in peer-reviewed publications, the extent to which they reflect clinical practice is uncertain. As noted in our report concerning their development (Haddad & Tylee 2013), the use of vignettes to examine depression recognition skills is problematic, primarily because of the ways it differs from clinical practice where observing, asking, probing, and discussion with the individual and with significant others are key elements of the assessment process. Using vignette measures resulted in a higher level of correct identification (baseline sensitivity was 66%) than in a meta-analysis of nurses' depression identification across all settings, which was 42% (Mitchell & Kakkadasam 2011). This higher level may be associated with a limited potential for improvement following training. Conversely, the vignettes provided a measure of specificity (48% at baseline) that was substantially lower than that found in real-world studies, with meta-analysis results for nurses across all settings found to be 84% (Mitchell & Kakkadasam 2011).

In this study it was impossible to blind participants to their allocation group, and participants' knowledge of group assignment may lead to the harbouring of expectations or to feeling deprived, which may influence responses. We mitigated against this by a waiting-list type design wherein the control group was provided with the training intervention at the end of the trial: this is likely to have contributed to the higher level of retention evident in the control compared to the intervention arm of the trial. The way in which outcome measure collection was supervised and administered (to prevent sharing of knowledge test answers and over-familiarisation with other measures) meant that the data collectors were not blind to study group either. However, the outcome measures were all in standardised self-report format, so there was little room for researcher-participant interaction to influence ratings. Coding of completed questionnaires enable blinded data entry and analysis.

This study was conducted in 13 London PCTs/boroughs, and although the service settings encompassed inner city and suburban areas and each cluster was comprised of a different service organisation, this may nonetheless limit the generalisability of study findings to other locations and services. Recruitment was based on a first-come, first-served basis, and the participating 13 PCT were the initial responders to invitations sent to all the 31 inner and outer London PCTs. This recruitment approach may have resulted in selection of services with greater interest and commitment to this area of service provision than those whose response was delayed or not forthcoming.

Loss of participants during study follow-up may be a source of bias and will reduce power affecting the validity, reliability and generalisability of results, with loss of 20% or more commonly regarded as a marker of a lower quality study and of more serious threats to validity (Fewtrell *et al.* 2008). In this study, 70% of the recruited sample completed outcome measures at the three-month principal outcome point (ranging from 79% for the knowledge measure, to 63% for the judgements of sensitivity and specificity). At the nine-month follow-

up, there were substantially fewer completed measures, overall 60%, and the extent of attrition was larger in the intervention than control arm (completed outcome measures: 52% compared to 71%). The extent of loss to follow-up is a clear weakness of this study; however the baseline characteristic specialist practitioner status in each trial arm was found not to differ between those seen and not seen at follow-up, which suggests that attrition did not substantially differ between trial arms or between baseline and follow-up in regard to this measured variable (specialist practitioner status at baseline: 49.2% - control, 53.1% - intervention; at 3-months: 48.1% - control, 56.7% - intervention; and at 9-months: 52.3% - control, 59.5% - intervention).

Attrition was related in part to exceptional workforce demands at the time of this study. In September 2008, a human papilloma virus (HPV) vaccination programme was introduced in England, with all 12- to 13-year-old and 17- to 18-year-old girls being offered the vaccine, which is primarily delivered by school nurses and a considerable additional demand on workforce capacity. Additionally, in the wake of the publicising of the child abuse case of Baby Peter (Serious Case Review, November 2008) and the period that followed, there was a considerable rise in school nurses' involvement in child protection referrals, investigations, proceedings (Macleod *et al.* 2010) which similarly interfered with continued participation this study.

Conclusions

School nurses are well-placed to promote good emotional health and provide early intervention services for young people at risk of developing mental health problems. This activity fits well with school-based health promotion addressing health-related behaviours that may be established in adolescence such as alcohol and substance use, healthy eating, sexual practices and physical activity. The importance of these activities and of the school nurse's role in their delivery are widely recognised, and identified in policy and research in the UK and many other countries (WHO Regional Office for Europe 2010, National Association of School Nurses 2013, Royal College of Nursing 2017).

School nurses receive limited training in mental health and have limited confidence in this part of their role (Haddad *et al.* 2010); and this study has demonstrated, using robust methods, that a relatively brief educational package can have positive and sustained impacts on this important area of practice. This evaluation adds to our understanding of school-based nurse-led health care, indicating that a purpose-designed training package is effective in improving the knowledge of school nurses about depression in young people, their confidence in working with young people who might be depressed, and aspects of their ability to correctly distinguish depression from distressing life problems.

Enhancing school nurses' knowledge, attitudes and skills is essential to enable them to work effectively as mental health promoters and for them to better collaborate with their teaching and health professional colleagues in early recognition, support and intervention for young people who are at risk. Although professional education innovations of this sort may be valuable, it is important to note that school nurses in the UK are a workforce that has substantially reduced in numbers since 2010, and that more recent changes in the commissioning of public health services have been associated with further decline in staff numbers. School nurses make a vital contribution to young peoples' health and have a key role to play alongside other professionals in improving mental health in schools; but as well as professional development and training there needs to be acknowledgment and support for their role.

Competing interests

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Authors' contributions

MH, AT, TF, VP contributed the study design, and the delivery and management of the project, MH and BW analysed the findings. All authors contributed to the reporting of the study.

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