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Associating school doctor interventions with the benefit of the health check: an observational study

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ABSTRACT

Background The benefits of school doctor interventions conducted at routine general health checks remain insufficiently studied. This study explored the associations of school doctor interventions with the doctor-evaluated and parent-evaluated benefits of routine health checks.

Methods Between August 2017 and August 2018, we recruited a random sample of 1341 children from grades 1 and 5 from 21 Finnish elementary schools in 4 municipalities. Doctors routinely examined all children, who were accompanied by parents. The doctor-reported interventions were categorised into six groups: instructions and/or significant discussions, prescriptions, laboratory tests and/or medical imaging, scheduling of follow-up appointments, referrals to other professionals and referrals to specialised care. Doctors evaluated the benefit of the appointment using predetermined criteria, and parents provided their subjective perceptions of benefit. Interventions and reported benefit were compared using multilevel logistic regression.

Results Doctors reported 52% and parents 87% of the appointments with interventions beneficial. All interventions were independently associated with doctor-evaluated benefit (ORs: 1.91–17.26). Receiving any intervention during the appointment was associated with parent-evaluated benefit (OR: 3.25, 95% CI 2.22 to 4.75). In analyses of different interventions, instructions and/or significant discussions (OR: 1.71, 95% CI 1.20 to 2.44), prescriptions (OR: 7.44, 95% CI 2.32 to 23.91) and laboratory tests and/or medical imaging (OR: 3.38, 95% CI 1.34 to 8.55) were associated with parent-evaluated benefit. Scheduled follow-up appointments and referrals to other professionals showed no significant association with parent-evaluated benefit.

Conclusions Doctors and parents valued the appointments with interventions. Parents especially appreciated immediate help and testing from the doctor.

Trial registration number NCT03178331.

What is known about the subject?

- A systematic review on the effectiveness of school health services suggested a need for assessment of routinely delivered school health services.
- Previously, doctors regarded 41% and parents 83% of the health checks performed by a school doctor as beneficial.

What this study adds?

- Doctors conducted interventions for 78% of the participating 1013 children. Doctors especially valued the appointments where interventions required their medical expertise.
- Parents appreciated immediate instructions, medical prescriptions, and testing from the doctor compared with scheduled follow-up or referrals to other professionals.

INTRODUCTION

The organisation and financing of school health services differ globally across over 100 countries.[1–4] In Europe, the main features include health promotion, preventive care and medical treatment procedures with a holistic bio-psycho-social approach.[3] School health services and school-based health centres may improve educational and health-related outcomes and they seem cost beneficial.[5–9]

Finland is a high-income country with an extensive health check system starting from pregnancy.[10 11] The system is based on the Finnish law and instructions provided by the National Institute for Health and Welfare.[12] School doctors perform routine general health checks in grades 1, 5 and 8 (at ages 7 years, 11 years and 14 years, respectively) in addition to annual health checks by school nurses. Our previous research concluded that the concern-based need for a school doctor health check is an important predictor of doctor-evaluated benefit of the health check.[13]

According to a systematic review on the effectiveness of school health services, a demand remains for assessment of routinely delivered school health services.[14] The WHO guideline on school health services recommends clarification of what is already being done and by whom, the identification of conditions to be targeted and the set of

interventions to be employed.[15] The benefits of school doctor interventions conducted in the setting of routine general health checks remain insufficiently studied. This study aimed to elucidate the potential benefits.

METHODS

Study design

In this observational study of randomly selected elementary school children, the interventions provided by school doctors were compared with the benefit or harm of the doctor's appointment as reported by the doctors and parents. In brief, data collection took place in 2017–2018 in four cities/municipalities in Finland.[11] In one of the cities (Helsinki) doctors worked exclusively in schools, whereas in the three other cities/municipalities (Tampere, Kerava and Kirkkonummi), some doctors worked part time in schools and also provided health checks before school-age and medical services at health centres.

Participants

In Helsinki, six school doctors gave consent to participate in the study and chose schools from different socioeconomic areas in the city. In Tampere, Kirkkonummi and Kerava, medical directors enrolled doctors with varying education and work experience and schools from different socioeconomic areas. All schools were public elementary schools. The school nurses and teachers were recruited from their respective schools.

Between August 2017 and August 2018, we enrolled a random sample of 1341 eligible children from the participating schools. Exclusion criteria were children mainly studying in special education groups and children whose parents needed an interpreter.

Participation rates, reasons for non-participation and doctor-evaluated and parent-evaluated benefits or harm of appointments have been described previously.[13] In brief, with a participation rate of 75.5%, 1013 children participated in the study. This included 506 first graders (age 7–8 years) and 507 fifth graders (age 11–12 years) from 21 public elementary schools. Overall, the 14 participating doctors considered 410 (40.6%) of the health checks as being beneficial. The parents perceived 812 (83.4%) of the health checks as being beneficial, and respondents rarely reported harm.

Procedures

All school doctors performed children's health checks as usual and had access to routine background information and patient records from the health centre and specialist care. The extensive health check in Finnish school health services is described in the study protocol.[11] Typically, a routine health check takes 30 min. After each health check in this study, the doctors had 5-minute extra time to fill in an electronic study report including details on all interventions that they undertook during the health check. In addition, the doctors evaluated the benefit or harm of the appointment using predetermined criteria. The parents evaluated their subjective perception of the benefit or harm of the health check in their own report (patient-reported experience measure, PREM).

Outcomes

The outcome measures were the interventions undertaken during the health check and the doctor and parent evaluations of benefit/harm of the appointment. Intervention types were collected from the electronic study reports completed by school doctors after the health checks.

Doctors assessed the benefit or harm of each health check on a six-point Likert scale (from 'Quite a lot of harm' to 'A great deal of benefit') according to the predetermined criteria of the study protocol.[11] The doctors reported quite a lot or a great deal of benefit if they performed any significant interventions based on predetermined criteria. The category of 'Only a little benefit' was used if the school nurse could have replaced the doctor. The doctors recorded harm if the interaction was unsatisfactory, or if they suspected no progress in care or denial of school doctor services in the future. The parents evaluated how beneficial or harmful they considered the school doctor's examination using the same scale as doctors without the predetermined criteria. English translations of the PREMs are provided in additional files 5 and 6 of the study protocol.[11]

We combined the responses 'Quite a lot of benefit' and 'A great deal of benefit' into one category and refer to them as beneficial. The responses 'Only a little benefit', 'No benefit or harm', 'Only a little harm', 'Quite a lot of harm' and 'I don't know' were grouped into little or no benefit.

Statistical analyses

According to power calculations, the amount of children needed was sufficient for this study.[11] Frequencies with percentages were used as descriptive statistics.

The association of the doctors' interventions with the doctor-evaluated and parent-evaluated benefis of the health check were analysed using multilevel logistic regression to account for the clustered nature of the data. Four-level models with child at level one, school at level two, doctor at level three and city/municipality at level four were used and were adjusted for grade. ORs with 95% CIs were used to express the results. SAS V.9.4 System for Windows was utilised for multilevel modelling. Other analyses were conducted using IBM SPSS Statistics V.25.0 for Windows. P values less than 0.05 were regarded as statistically significant.

Patient and public involvement

No patients or public were involved in this study.

RESULTS

The doctors conducted interventions in 78% of the 1013 children's health checks (online supplemental table 1). The most common intervention was the provision of instructions and/or significant discussions regarding physical health for 52% of families. Nutrition, skin or weight were the most common reasons for instructions or discussions. In 17% of the health checks, doctors scheduled new school healthcare appointments mostly to check growth or posture. Doctors planned follow-up appointments with themselves in 3% of cases. Abdominal symptoms and overweight/obesity were the most common reasons for laboratory testing. Doctors conducted interventions related to cardiac murmurs in six cases. Doctors made referrals for psychosocial, neurologic or mental problems for 9% of children. Most referrals to other professionals for physical health problems were directed to physiotherapists and for psychosocial problems to psychologists or social workers. Doctors contacted child-protection services in less than 0.5% of cases.

Doctors' evaluations of benefit or harm were available for 1010 children's health checks. The doctors reported 52% of the appointments with any intervention beneficial and none of the appointments with no interventions beneficial. All interventions were independently associated with doctor-evaluated benefit (ORs: 1.91–17.26, p<0.001) (table 1). Prescriptions (OR: 5.56, 95% CI 3.46 to 8.94), laboratory tests and/or medical imaging (OR: 15.16, 95% CI 7.35 to 31.26) and referrals to specialised care (OR: 17.26, 95% CI 6.61 to 45.05) were most strongly associated with doctor-evaluated benefit (p<0.001).

Parents' evaluations of benefit or harm were available for 971 children's health checks. Parents reported 87% of the appointments with any intervention beneficial and 68% of the appointments with no interventions beneficial (table 2). Receiving an intervention during the appointment was associated with parent-evaluated benefit (OR: 3.25, 95% CI 2.22 to 4.75). The appointments with instructions and/or significant discussions (OR: 1.71, 95% CI 1.20 to 2.44), the appointments with prescriptions (OR: 7.44, 95% CI 2.32 to 23.91) and the appointments that lead to laboratory tests and/or medical imaging (OR: 3.38, 95% CI 1.34 to 8.55) were more often considered as beneficial than the appointments without

Table 1 Association of doctor's intervention with doctor-evaluated benefit of the health check; multilevel logistic regression analysis

	Total	Beneficial health check, as assessed by doctor		
Doctor's intervention	**N**	**n (%)**	**OR (95% CI)**	**P value**
Any intervention				
Yes	791	410 (51.8)	NA	<0.001*
No	219	0 (0)		
Instruction and/or significant discussion				
Yes	605	282 (46.6)	1.91 (1.44 to 2.55)	<0.001
No	405	128 (31.6)	1	
Prescription				
Yes	105	77 (73.3)	5.56 (3.46 to 8.94)	<0.001
No	905	333 (36.8)	1	
Laboratory tests and/or medical imaging				
Yes	86	77 (89.5)	15.16 (7.35 to 31.26)	<0.001
No	924	333 (36.0)	1	
Follow-up appointment in school health service				
Yes	175	114 (65.1)	3.06 (2.13 to 4.39)	<0.001
No	835	296 (35.4)	1	
Referral to other professional within school or community services				
Yes	136	94 (69.1)	4.29 (2.82 to 6.52)	<0.001
No	874	316 (36.2)	1	
Referral to specialised care				
Yes	52	47 (90.4)	17.26 (6.61 to 45.05)	<0.001
No	958	363 (37.9)	1	

Doctor-reported benefit was available for 1010 children.
*Fisher's exact test.
CI, Confidence interval; NA, not available due to zero frequency; OR, Odds ratio; adjusted for grade.

Table 2 Association of doctor's intervention with parent-evaluated benefit of the health check; multilevel logistic regression analysis

	Total	Beneficial health check, as assessed by parent		
Doctor's intervention	N	n (%)	OR (95% CI)	P value
Any intervention				
Yes	766	669 (87.3)	3.25 (2.22 to 4.75)	<0.001
No	205	140 (68.3)	1	
Instruction and/or significant discussion				
Yes	587	507 (86.4)	1.71 (1.20 to 2.44)	0.003
No	384	302 (78.6)	1	
Prescription				
Yes	102	99 (97.1)	7.44 (2.32 to 23.91)	<0.001
No	869	710 (81.7)	1	
Laboratory tests and/or medical imaging				
Yes	85	80 (94.1)	3.38 (1.34 to 8.55)	0.01
No	886	729 (82.3)	1	
Follow-up appointment in school health service				
Yes	170	146 (85.9)	1.12 (0.69 to 1.81)	0.66
No	801	663 (82.8)	1	
Referral to other professional within school or community services				
Yes	128	111 (86.7)	1.48 (0.85 to 2.58)	0.16
No	843	698 (82.8)	1	
Referral to specialised care				
Yes	51	48 (94.1)	3.25 (0.99 to 10.66)	0.05
No	920	761 (82.7)	1	

Parent-evaluated benefit was available for 971 children.
CI, Confidence interval; OR, Odds ratio; adjusted for grade.

these interventions (p<0.01 for all). The appointments that resulted in scheduling a follow-up appointment in school health services, a referral to other professionals within the school or community services or a referral to specialised care showed no significant association with parent-evaluated benefit (table 2).

DISCUSSION

In this study of routine health checks in elementary school, doctors and parents valued the appointments with interventions more than the appointments with no interventions. Most interventions targeted physical health. Appointments with instructions and/or significant discussions, prescriptions and laboratory tests and/or medical imaging were associated with both doctor-evaluated and parent-evaluated benefits. By contrast, appointments that resulted in scheduling of follow-up appointments, referrals to other professionals within school or community services and referrals to specialised care were only associated with doctor-evaluated benefit.

Despite the increasing demand for professionals to provide care for children and adults facing mental health disorders,[16] doctors in this study rarely made referrals to specialist care for neurologic or mental health problems (0.9%), and rarely contacted child-protection services. Some families may have received referrals to these specialists already earlier or may have refused their help. Although the participation rate in this study was high, it is possible that the families with most stressors in their life refused to participate or were excluded from the study, and thus these findings may be skewed. Child maltreatment could be recognised and support offered through contacts with professionals working in schools,[17] although universal screening for child maltreatment is unsuitable.[18] Our findings strengthen our perception that child maltreatment is usually suspected and psychosocial problems are usually identified outside of doctors' routine health checks. These results are also in line with a Dutch study in which doctors' assistants were as capable as nurses or doctors to detect psychosocial problems.[19]

Among children who underwent a routine health check in elementary school, few children had physical findings that require a doctor's expertise to be

recognised, such as heart murmurs. Cardiac murmurs in children are common[20] and usually harmless.[21] In Finland, doctors already screen children for cardiac and other major physical health problems in health checks at the ages of 4–6 weeks, 4 months, 8 months, 18 months and 4 years.

The doctors reported that half of their appointments with interventions were beneficial. The doctors may have estimated that the school nurse or another professional could have provided the intervention as well. In the Netherlands, doctors' assistants detected children's overweight, visual disorders and psychosocial problems as well as did doctors or nurses.[19] According to a Cochrane review, nurses may achieve higher patient satisfaction than primary care doctors.[22] In some cases, the doctors may have been uncertain about the significance of their findings. Overdiagnosis is a common problem involving childhood conditions such as food allergy, obstructive sleep apnoea and attention-deficit/hyperactivity disorder.[23–27] Prescriptions, laboratory tests and/or medical imaging, and referrals to specialised care were most strongly associated with doctor-evaluated benefit. These interventions usually require medical training. Some prescription renewals could potentially have been handled more effectively through the electronic health record system than during an appointment.[28] The doctors regarded none of the appointments without interventions beneficial. These findings are in line with the predetermined criteria of benefit and harm[11] and strengthen the validity of the output measure of doctor-evaluated benefit.

Parents reported 87% of the appointments with interventions beneficial and reported benefit also after 68% of the health checks with no interventions. The parents may have appreciated the thorough check of their child for abnormalities and the invitation to meet a doctor. Expecting parents to know when doctor's expertise is required is unreasonable. Parents are usually unaware that as a consequence of universal health checks at certain grades only limited school doctor resources are available to children in other grades. Few paediatric primary care providers actually have health policy discussions with families.[29]

Parents' evaluations may reflect the barriers in actualising planned care. Children may miss their planned appointment at specialised care or other experts for several reasons, including logistical/practical factors, long waiting times and quality of interaction between parent and health professional.[30] The parent may have had no concerns regarding their child prior to the health check and they may even have disagreed about the doctor's concern. In a Dutch study, child health professionals more often perceived psychosocial problems in children aged 8–12 years than did their parents.[31] Such situations of dissonance may require more time for resolution than is available during a routine health check. In almost one-fifth of the health checks, doctors scheduled new school healthcare appointments mostly to check growth or posture. However, doctors rarely planned follow-up appointments with themselves. For an intervention to be effective, continuity across time and services must be ensured.[32] Some referrals to other professionals and specialised care could potentially have been avoided by models of integrated care such as multidisciplinary meetings, which may enhance patient satisfaction and increase perceived quality of care.[33]

This study has several strengths. The data included in this study have been collected recently before the COVID-19 pandemic with a high participation rate, thus representing the situation of today's generation of children in developed countries with an extensive health check system during childhood. We increased the generalisability of the results by including schools from different municipalities and socioeconomic areas. We reduced information bias by systematic training of the participating doctors on the criteria of benefit.

One of the study limitations is that the physicians participating were not a random sample, though the participants had varying education and work experience. Second, selection bias is possible as a quarter of invited families declined participation, and non-participants likely differed from participants. We consciously excluded vulnerable groups: children mainly in special education groups and whose parents needed an interpreter. Many of the challenges in these groups are evident: children already have contacts with various professionals and school healthcare should be involved to confirm adequate services. Although the doctors followed predetermined criteria when assessing benefit, information bias may have emerged. This was a self-assessment with unavoidable subjectivity. We considered this in the statistical analyses by using multilevel logistic regression and comprised different doctors as one of the four covariates. The small number of referrals to specialised care may have had an effect on the results.

The surrogate outcomes of doctor-evaluated and parent-evaluated benefits regarding any intervention should be appraised critically. Surrogate outcomes can fail to predict a true clinical outcome.[34] Globally, the provision of services and the intensity and extent of interventions related to obesity and mental health problems are often inadequate and insufficient.[35 36] Despite health checks in Finland, Häkkänen and co-workers showed that obesity increased and obese children remained obese during elementary school.[37] The long-term impacts of the interventions in this study remain unknown.

CONCLUSIONS

In this study, both school doctors and parents valued the appointments with interventions. Parents appreciated immediate instructions, medical prescriptions and testing from the doctor compared with scheduled follow-up or referrals to other professionals. Doctors

especially valued the appointments where interventions required their medical expertise. These findings suggest that school doctors should provide children and families with evidence-based interventions instead of routine health checks. Future studies should investigate the long-term effectiveness of school doctor interventions and school doctor participation in school multidisciplinary teams.

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Contributors KN conceived and designed the study, collected, analysed and interpreted the data, and drafted the manuscript. SK and MK made significant contributions to the design of the multicentre study and analysis plans. TV was responsible for and mainly conducted the statistical analyses. EH participated in the design and analyses of the pilot study and the design of the multicentre study. All authors interpreted the results, critically reviewed the manuscript, approved the final manuscript as submitted and agree to be accountable for all aspects of the work. The guarantor SK accepts full responsibility for the conduct of the study, had access to the data, and controlled the decision to publish.

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