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Exploring the potential of triage and task-shifting in preventive child health care

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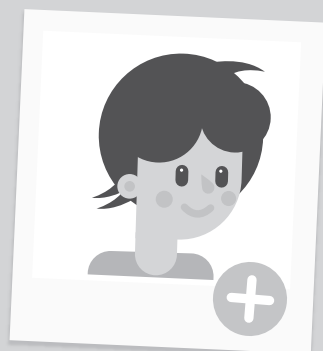
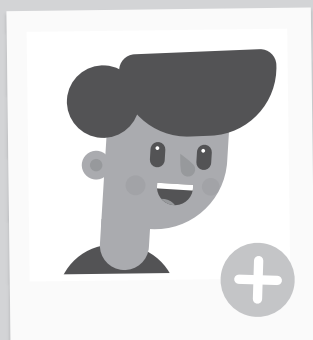
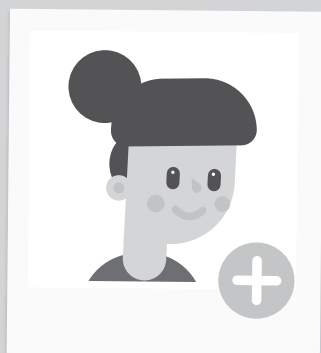
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A novel triage approach to identifying health concerns



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ABSTRACT

Background

We investigated the detection of health problems in Preventive Child Healthcare (PCH) by a novel triage approach for routine health assessments. In the triage approach, all children were preassessed by a physician's assistant, and only those in need of follow-up were assessed by a PCH physician or nurse. In the traditional approach, all children were assessed by a PCH physician or nurse.

Methods

A prospective cohort design was used with data on routine assessments of 1897 children aged 5 to 6, and 10 to 11 years. Primary outcomes were the detection of overweight, visual disorders and psychosocial problems, with the type of approach (traditional vs triage) as the independent variable. To assess the severity of health problems, BMI, Snellen, Strengths and Difficulties Questionnaire, and Child Behavior Checklist, scores were compared for both approaches in subgroups of children with overweight, visual disorders or psychosocial problems.

Results

No significant differences were found between the approaches in terms of the detection of incident cases of overweight, visual disorders and psychosocial problems. Significantly higher Strengths and Difficulties Questionnaire scores were found in the subgroup with psychosocial problems when the triage approach was used. Marginal differences between the approaches were found for severity of overweight in the subgroup of overweight children.

Conclusions

A novel triage approach to PCH resulting in less involvement of physicians and nurses in routine assessments appears to detect health problems as effectively as the traditional approach in place.

More research is needed to determine the long-term outcomes of the 2 approaches.

What's Known on This Subject

Scientific evidence is available about health and economic effects of screening activities in preventive child health. Efficient use of the skills of physicians and nurses using triage may help to improve the accessibility of health services and quality of care.

What This Study Adds

A novel triage approach to preventive child health care resulting in less involvement of physicians and nurses in routine assessments appears to achieve levels of health problem detection that are comparable with the traditional approach in which all children are assessed regularly.

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INTRODUCTION

Preventive services that screen health and monitor child growth and development contribute significantly to the early detection of physical and mental health problems in children [1,2]. Sufficient evidence exists that screening for amblyopia, monitoring of psychosocial problems and growth in children of elementary school age, enhance health and social well-being [3-7]. However, awareness is growing that preventive services for children must be conducted more cost-efficiently and better alignment with current health system issues, such as improved use of physician and nurse competences, evolving health priorities, inequities in health, and uneven access to preventive care [8-11].

Many countries have preventive child health care (PCH) programs for universal routine child health assessments, and vaccination programmes. The Netherlands has a free PCH program for all children aged 0 to 18 years, including ~17 routine health assessments. They are examined for a wide range of disorders such as congenital disorders, visual and hearing impairment, psychosocial problems, motor dysfunction, and overweight. The attendance rate of the routine programme is > 90% [12]. The PCH assessments are conducted by specialized community physicians or nurses ("PCH professionals"). When problems are identified by PCH professionals, they decide whether to refer for extra assessments by PCH or to external specialised care.

The Dutch system of health assessments is currently being debated, despite its proven merits [5-13]. A criticism is that routine assessments at isolated points in time provide only snapshots of the dynamic process of development and growth, especially during school age. Moreover, the issue of responsibility for the detection of health problems in children has been discussed: does this reside entirely with PCH professionals, or is it a responsibility that should be shared with parents or, for example, teachers?

In response to this criticism, a novel approach has been developed for routine health assessments for children aged 4 to 18 years based on triage and shifting of tasks among PCH professionals. A triage assessment procedure allows physicians and nurses to focus more on children with special health care needs often linked to social inequity, mental health, and lifestyle-related problems [14,15]. Furthermore, the workload of physicians for routine health assessments can be reduced, improving the accessibility and quality of care [14,15]. A 2-step triage procedure has been introduced in the Netherlands to identify more efficiently children with potential health problems. (see Fig. 1). Children are first seen by a physician's assistant who follows a strict preassessment protocol. The assistant refers only children with suspected health care needs to a follow-up assessment by a PCH physician or nurse. Both pre-assessment and follow-up assessment are part of the triage procedure.

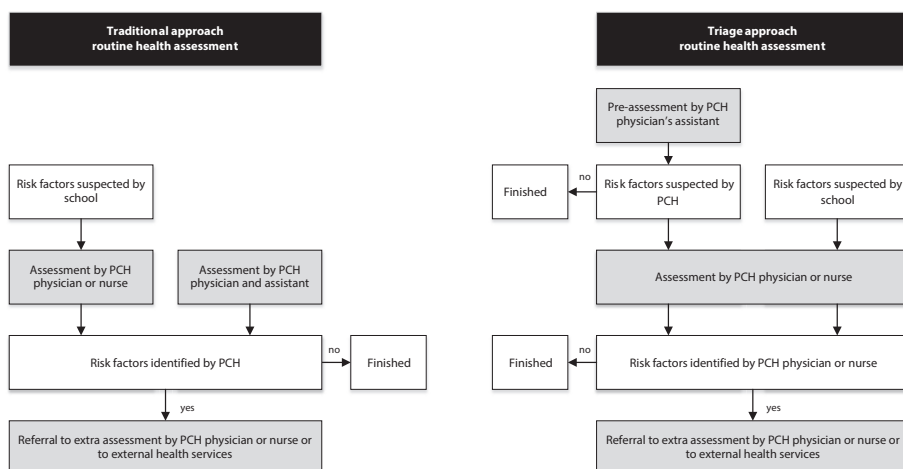


Figure 1. The delivery of care by routine health assessments: the traditional approach and the triage approach compared.

A pilot study of the triage approach [16] found no change in accessibility of PCH, but significantly fewer children were referred for extra PCH assessment or for treatment by an external specialist than in a traditional approach. Further research was needed to compare the quality of care delivered by the triage approach to traditional PCH.

This article describes a study of the implications of the triage approach for routine child health assessments. The research question addressed was as follows: How does the triage approach perform compared with the traditional PCH approach in terms of identifying overweight, visual disorders and psychosocial problems?

METHODS

A prospective observational cohort design was used to study PCH levels of health-problem detection. The Medical Ethics Committee of Leiden University Medical Centre approved this study.

Study sample

We obtained our sample from a population of elementary school children attending PCH services in 4 distinct urban and nonurban areas in the Netherlands. Two services used the triage approach, and 2 services the traditional approach. The study group was randomly selected from schools stratified for socio-economic status (low, middle and high status) and urban or rural area. All children eligible for routine assessment and aged 5 to 6, or 10 to 11 years were then selected and routine health assessments were organised at the selected schools. A sample of 986 children (21 schools) went through the traditional approach, and a sample of 1008 children (20 schools) went through the triage approach.

Data collection

Data were obtained from routinely registered digital PCH records. Additional data for new cases detected by PCH were registered in their records for the following health problems: overweight, visual disorders and psychosocial problems. These health indicators were chosen because identification procedures for these items are known to be valid [12,13]. The assessment procedures were described in uniform protocols for all PCH services covered by this study and

the PCH professionals participating were informed about these protocols. For the sake of completeness, a random sample of the data set from the PCH records was checked manually. The quality of data relating to health outcomes was checked by comparing them with information from other registered data fields and open answers about the children's health status. Children in the study sample underwent assessments from January to April 2012. Data relating to children requiring follow-up assessment were included until December 2012.

Procedures

The traditional health assessments were conducted with parents present. Triage preassessments were conducted in the absence of parents, but they were asked to provide consent for the triage screening. Before the screening or the routine health assessment took place, parents filled out a general questionnaire about the health of their child and the Strengths and Difficulties Questionnaire (SDQ) questionnaire to measure psychosocial problems [18]. We used the Child Behaviour Checklist (CBCL) as a gold standard to assess whether PCH professionals failed to identify children with psychosocial problems. The CBCL is a validated questionnaire that measures behavioural and emotional problems [19,12]. Random samples of 300 parents for each approach were asked to fill out the CBCL, which was sent with the standard invitations. The completed CBCL questionnaires were returned to the PCH in a sealed envelope and directly forwarded to the research institute. In addition, parents of children identified with psychosocial problems by the PCH physician or nurse were asked to fill out a CBCL.

The following child and family sociodemographic variables were recorded by the PCH professionals: gender of the child (boy/girl) and age. The socio-economic status of the children was extracted from national census statistics and established on the basis of postal codes for their home addresses and on the basis of education, income and employment status of inhabitants of that area. Finally, the results of the assessments of height and weight, visual screening and psychosocial health status were recorded by the PCH professionals.

Outcomes

Primary outcomes in this study were the incidence of overweight, visual and psychosocial problems. Overweight was determined by measuring height and weight, and classified using the child's Body Mass Index (BMI) according to

international standards, [22,23] in combination with the observations of the PCH professional. Visual disorders were determined using a visual acuity test (the Snellen chart with SD scores based on the Dutch general population) and an assessment of strabismus [13]. A visual disorder was classified as a problem (yes/no) if PCH professionals concluded that vision was insufficient on the basis of the tests.

Psychosocial problems included child behavioural and emotional problems, social interaction problems and/or child abuse. The identification of these psychosocial problems was based on the child's elevated SDQ total problem score or elevated SDQ impact scores [18], or on the response to the following question asked by the professional: "Are there additional child signs or signs expressed by others indicating a psychosocial problem?". SDQ cutoffs were calculated on the basis of the cutoffs used in PCH. The group of children identified with psychosocial problems by both methods were compared with the group of children with returned CBCL questionnaires. CBCL cutoffs were based on a large-scale Dutch sample using the 90th percentile for age and gender [24]. Children who had received or were receiving treatment were not classified as incident cases for any of the problems.

Statistical analyses

First, we used chi-square testing to assess differences between the background characteristics of children going through the 2 approaches. Next, we used logistic regression analysis to compare attendance rates of children attending the traditional PCH assessments, and triage preassessments and follow-up assessments, to analyze the response to both PCH approaches. Third, a comparison of the incidence rates for overweight, visual, and psychosocial problems between the 2 approaches was made using multilevel logistic regression analysis. We performed these analyses with identified problem by PCH (yes vs no) as outcome variable (overweight, visual disorder and psychosocial problem) and approach as predictor. In all analyses, we adjusted for socio-economic status. Multilevel analyses were conducted because the assessments of children were stratified by health care professional [25]. For all regression analyses, we studied the interaction effects of the children's age with type of approach on the outcome measures. Fourth, to study the severity of health problems found in both approaches, the BMI, Snellen and SDQ and CBCL

scores were studied in the subgroups of children identified with overweight, visual disorders or psychosocial problems using the chi-square test or Fisher's exact test. Finally, we compared the proportion of false-negative cases of psychosocial problems on the basis of the CBCL score of both approaches using chi-square test. Effects were statistically significant at a $P < .05$ (2-sided). SPSS Statistics was used to analyze the data (SPSS 22.0 for Windows, SPSS Inc., Chicago, IL).

RESULTS

Response and study sample

The response for the routine assessments was the same in the triage and traditional approaches (Figure 2). The rate of attendance for the assessments in the traditional approach was 93.6%.

For triage, 96.6% of the children attended the preassessment, and 89.4% of the referred children attended a follow-up assessment by a physician or nurse (Figure 2).

The response to the CBCL questionnaire was higher from the parents in the triage approach compared to the traditional approach: 85.5% and 70.8%, respectively, in the random subsample who received the questionnaire, and 50.3% and 32.0%, respectively, in the subsample of children identified with psychosocial problems by PCH.

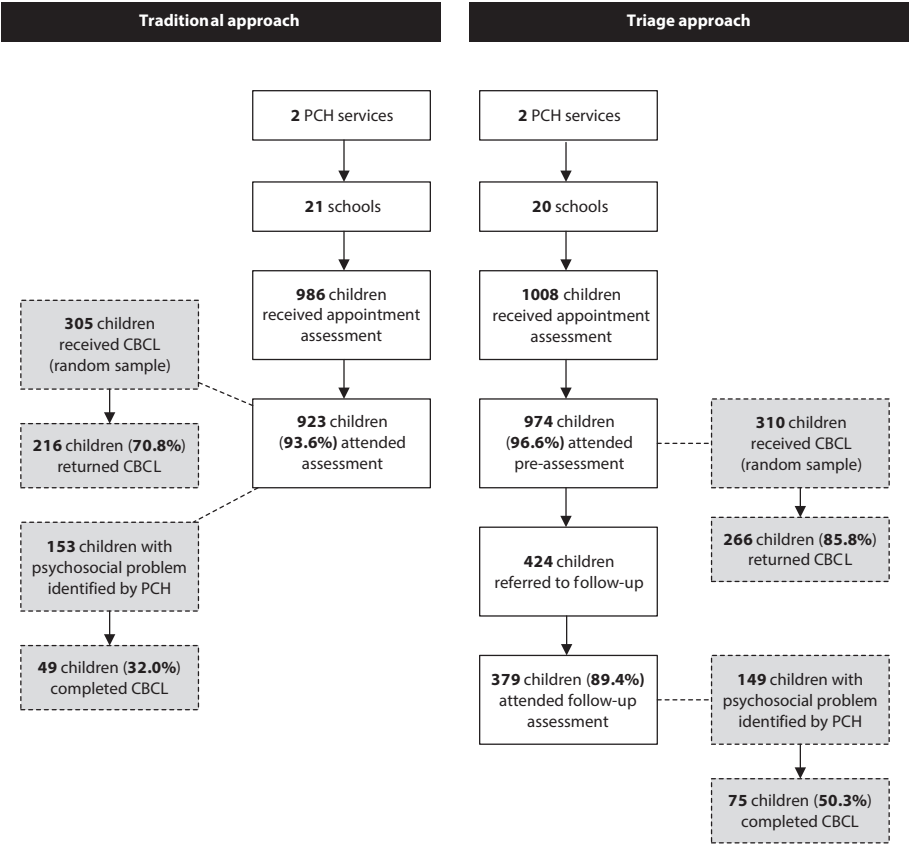


Figure 2. Response flow chart showing traditional and triage approach.

We found no differences in age or gender of the children in the triage and traditional approaches. However, there was a difference in the socio-economic status of the children (Table 1): the triage sample included more children of a low socio-economic status.

Table 1. Characteristics of children assessed by traditional and triage approach.

	Traditional approach (N=923), N(%)	Triage approach (N=974), N(%)
Gender		
Boy	455 (49.3)	485 (49.8)
Girl	468 (50.7)	489 (50.2)
Age (years)		
≤8	468 (51.8)	480 (49.3)
≥9	436 (48.2)	494 (50.7)
Socio-economie status (SES)*		
Low	342 (37.1)	415 (42.9)
Middle	372 (40.4)	304 (31.4)
High	207 (22.5)	249 (25.7)

* $P < 0.001$ *Incidence of identified problems by PCH versus approach*

We did not find differences between the 2 approaches for the incidence of overweight, visual disorders and psychosocial problems (Table 2). Because routine PCH assessments were carried out in the age groups 5 to 6 and 10 to 11 years, interaction effects of the PCH approach with children's age on the incidence of overweight, psychosocial and visual problems were studied. No such interaction effects were found. In other words: age had no influence on the relation between PCH approach and incidence of identified problems.

Table 2. PCH physician or nurse in the traditional approach and the second step of the triage approach / Rates of detection of incident cases of overweight, visual disorder and psychosocial problems in the traditional and triage approaches to preventive child healthcare assessment.

	Traditional approach (N=923)	Triage approach (N=974)			
	Assessment by PCH physician or nurse, N(%)	Pre-assessment by PCH physician's assistant, N(%)	Follow-up assessment by PCH physician or nurse, N(%)	Odds Ratio[^]	95%CI
Overweight	85 (9.2)	153 (15.7)	70 (7.2)	0.8	0.4 -1.3
Visual disorder	25 (2.7)	55 (5.5)	21 (2.2)	0.9	0.6 -1.4
Psychosocial problem	153 (16.6)	172 (17.7)	149 (15.3)	0.9	0.6 -1.2

[^] Multilevel logistic regression analyses with health problems as the outcome variable, the approach (traditional assessment or follow-up triage assessment) as the independent variable, and socio-economie status as co-variate

We found a marginal difference in numbers of children with elevated BMI scores in the triage and traditional approaches. The subgroup of children identified with overweight in the triage approach included more children with a BMI indicating severe obesity than the traditional approach, which found more children with a BMI indicating overweight.

We also found a statistically significant difference in the subgroup of children with psychosocial problems identified by PCH. More children identified with psychosocial problems in the triage approach had an elevated SDQ score than children in the traditional approach.

We also assessed whether, on the basis of their CBCL scores, children with psychosocial problems were missed by PCH professionals (in other words, whether there were false-negatives). On the basis of their CBCL score, 2 children in the traditional group and 1 child in the triage group were not identified as having a psychosocial problem by the PCH physician or nurse.

Table 3. *The association between the preventive child healthcare approach and the BMI, Snellen, SDQ and CBCL scores in subgroups of children with overweight, visual disorder or psychosocial problems as identified by the physician or nurse#*

	Traditional approach, N (%)	Triage approach, N (%)
Identified overweight by PCH	85 (100)	70 (100)
BMI overweight	65 (78)	50 (71)
BMI obese	14 (17)	20 (29)*
Identified visual disorder by PCH	25 (100)	21 (100)
Insufficient Snellen score	18 (75)	17 (90)
Identified psycho social problem by PCH	153 (100)	149 (100)
Elevated CBCL	6(12)	17 (23)
Elevated SDQ	88 (58)	124 (83)**

* $P = 0.05$

** $P < 0.001$

Missing data (BMI N=2; visual disorder N=3; SDQ N=0; CBCL N=178, due to non-response of the CBCL in the subsample of children identified with a psychosocial problem, see figure 2.)

DISCUSSION

This study aimed to investigate the detection of health problems in PCH with a new triage approach in routine health assessments for children aged 5 to 6, and 10 to 11 years.

We found no difference in the detection rates for incident cases of overweight, visual and psychosocial problems between the triage approach and the traditional approach. The study found a marginal difference between the 2 approaches in the BMI scores in subgroups of children identified with overweight or obesity by PCH. In the triage approach the subgroup of children identified with overweight included more children with a BMI indicating obesity, while the traditional approach included more children with a BMI indicating less severe overweight. Significantly higher SDQ scores were found in the subgroup of cases with identified psychosocial problems when the triage approach was used compared to the traditional approach.

These results can be explained by differences in the assessment procedures used in the two approaches[16]. Triage preassessments are conducted in the absence of parents, whereas the traditional health assessments are conducted with parents present. Literature claims that the early detection of health problems is more accurate when parents are present [24,26], but this study did not find a difference in identification rates between the 2 approaches.

The detection of children with higher scores on BMI obesity and SDQ by PCH with the triage approach, may be the result of the inclusion of more children with a lower socio-economic status in the triage group facing these health problems. The higher proportion of children with elevated scores can also be explained by the different organization of assessments of children of the 2 approaches, where all children with elevated BMI and SDQ scores during the triage pre-assessment are referred to follow-up by a physician or nurse for further diagnostic assessment [17].

Strengths and weaknesses of the present study

A strength of this study is that the 2 approaches were studied by comparing random samples of schools stratified by socio-economic status. We included a homogeneous group of children with regard to gender and age range and controlled for differences in socio-economic status. Moreover, the sample

in the current study was selected from the general Dutch population from urban and rural areas, making generalisation of the findings to other PCH organisations possible. Another strength is that we analyzed the incidence rates of a limited number of health problems for which commonly used standard screening guidelines exist. All 4 PCH services implementing triage and traditional approaches in this study used these guidelines, reducing the possibility of identification and reporting bias. We used the CBCL as a reference for the accuracy of identification of psychosocial problems in the 2 approaches because it is known to be a valid and well-adapted measure for psychosocial problems [19-21].

There are some methodological limitations that may have affected our results. The outcomes of the triage approach may be affected by a difference in the extent of the implementation of the innovative triage approach in the 2 triage PCH services. The 2 traditional PCH services had already been working with the traditional approach for a long time. Because it takes time to establish uniformity and adequate skills levels among all professionals working with the triage approach, the comparability with the traditional approach may have been affected. Another limitation is that the differences in detected severe problems between the triage and traditional group could not be confirmed by further diagnostic assessments. Finally, the small group size of the parents who returned CBCL questionnaires and the lower response in the traditional PCH group may also be a limitation. Prevalence of elevated CBCL may be underestimated in this response group.

Implications for practice and directions for future research

Economic circumstances and changing health demands urge to develop new ways of delivering care. The triage approach with task-shifting may be a promising way to achieve efficiency gains for routine assessments. In that case, more time will be available for physicians and nurses to focus on children with special healthcare needs that are often linked to social inequity, mental health, and lifestyle-related problems [14,15].

The differences in severity with respect to BMI and SDQ raises the question from a preventive public health perspective whether it is better to detect all children as early as possible or to select the more severe problems with a more

efficient approach. An advantage of the triage approach may be that parents with children with more severe problems are more willing to accept referral to extra care if necessary, with more promising results of further treatment. On the other hand, advice can be given to parents of children with less severe problems when all children are being assessed.

Research is needed to assess the accuracy of detection using the triage approach. An examination of the outcomes of referrals for extra assessment by PCH professionals or external specialized care providers could provide a picture of the accuracy of health-problem detection. More validated tools are needed with respect to the detection of health problems other than those included in this study. Availability of such tools enables the assessment of the generalizability of the triage approach in general. Research is also needed into the effects of triage in age groups other than those included in our study. On the basis of differences in salaries of the various professionals, we expect that the triage approach will lead to cost savings compared to the traditional approach (~10-20%); however, further research is required to document a possible reduction in healthcare costs when using a triage approach and task-shifting compared to the traditional approach.

CONCLUSION

Our study indicates that a novel triage approach to preventive child health assessment with less use of physicians and nurses appears to be as successful in detecting health problems in children as the traditional approach in which all children are regularly assessed. However, more research is needed to determine the long-term outcomes of the identification procedures for both approaches.

Contributors' Statements

Janine Bezem: drs. J. Bezem developed the triage approach, and contributed to the development of the triage protocols, acquisition and interpretation of data, and the drafting of the initial manuscript.

Meinou H.C. Theunissen: dr. M. Theunissen contributed to the design of the data collection instruments, carried out the analyses and interpretation of data, and reviewed the manuscript.

Mascha Kamphuis: dr. M. Kamphuis coordinated and supervised data collection, and critically reviewed the manuscript.

Mattijs E. Numans: Prof. dr. M.E. Numans contributed to the intellectual content and revision of this paper, and critically reviewed the manuscript

Simone E. Buitendijk: Prof. dr. S. Buitendijk contributed to the revision of the intellectual content of this paper, and critically reviewed the manuscript.

Paul L. Kocken: dr. P. Kocken was responsible for the concept and design, the analysis and interpretation of data, and the review and revision of the manuscript.

All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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