How good is general practice developmental screening?

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Abstract

All developmental screening in Somerset is performed by general practitioners and health visitors. A retrospective review of a cohort of 1504 7 year old children living in semirural Somerset found that the development assessment by a health visitor at age 3½ years had a sensitivity of 45% for identifying the 103 children with special educational needs, whereas the sensitivity of the preschool examination by a general practitioner was 56%. There was no relation between results of preschool developmental assessment and later reading ability. Of the 23 children in special schools, 22 had been identified independently of the developmental screening programme before starting school. Intervention was started at a mean age of 1 year 5 months (range 2 months to 3 years) for children with severe learning difficulties, and 3 years 9 months (2 years 3 months to 6 years 6 months) for children with moderate learning difficulties. The preschool medical examination revealed fairly minor medical problems: 29 of 81 children referred for specialist opinions were shown to be medically normal, and for only seven of the medically abnormal children was information about their conditions given to their teachers. In Somerset screening the development of all children at pre-determined ages has not been very useful.

Introduction

Since 1978 general practitioners in Somerset have done all paediatric preschool surveillance—that is, immunisations and developmental screening.¹ Until recently the appropriate knowledge and experience that made this possible were derived from previous paediatric experience during their training in hospital and practices and from individual courses that they had chosen to attend. There was no stated policy about the level of training, its aims, or its content. General practitioners and their health visitors were largely left to themselves to formulate what was to be done in each practice. The health authority agreed to pay for two preschool examinations, one at 6 weeks and another before the child started school.

In view of the current interest in the usefulness of developmental screening² we wanted to know how our system in Somerset performed.

Did the regular preschool screening checks identify children with later educational problems?

Did the screening tests pick up treatable medical conditions that would not otherwise have been identified?

Methods

We reviewed the health visitor records (and where necessary the hospital notes or general practitioner's notes) of all 7 year old children in the Yeovil, Crewkerne, and Bridgewater areas who were attending a school during February 1987 and who were born

between 1 September 1978 and 31 August 1979. This included any children who received home tuition but were affiliated to a school. The records of 1504 children were reviewed.

We compared the results of two preschool examinations as described elsewhere³ with the child's results on stage 1 of the Edinburgh reading test⁴ taken in February of the year in which the child was aged 7. All schoolchildren in Somerset sit this reading test. It is standardised for age and sex and scored from 70 (very low) to 130 (high) (mean 100). To accommodate schools that were late in sending their results we set the end point for our inquiry at 2 April 1987. The two preschool developmental examinations were the developmental check by a health visitor at 3 to 3½ years of age and the preschool check done by both general practitioner and health visitor when the child was 4 to 4½ years old. These two examinations were scored on a pass or fail basis depending upon whether the examiner thought that the child was normal or not.

Many parents see developmental testing as useful for picking up problems that could have an effect on education before the child gets to school. To examine this concept we assumed that developmental screening was a screening test to detect children with special educational needs and looked at the records of all the children who had been statemented (designated as needing special teaching) under the 1981 Education Act and all children who had been seen by an educational psychologist before 2 April 1987 and were receiving help at school (103 children). We then calculated specificities and sensitivities for the preschool medical done by general practitioners and health visitors (1052 children) and for the developmental assessment done by health visitors at age 3 to 3½ (815 children). We also looked at children from families in social classes IV and V and from single parent or unwaged families (total of 849 children) as a simple way of screening for the likelihood of having special educational needs.

By reviewing the records of all the children who had failed their preschool medical examination and looking at the reasons for their referral to other medical specialties we tried to identify educationally important medical conditions that were picked up solely by screening. We noted whether the medical information had been passed on to the child's teacher. From information obtained from our area's social services office we noted whether the child had been in care.

Because this was a retrospective study using a large number of children only significance levels of $p < 0.001$ are reported.

Results

One hundred and nine children did not sit their reading tests. Of these, 37 were withdrawn because their reading was so poor. Thirty of these children were known to have special educational needs before they entered school. Twenty seven of the 30 had either

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failed their preschool medical or not been invited to attend. We could not determine, however, whether the mainstream schools that absented their children from the test did this because the children were truly absent or because of other reasons—for instance, their proportion of non-readers who were classified as withdrawn from the school would then rise, and this could reflect upon the school and its ability to teach children to read.

There was no relation between reading scores and having passed or failed the preschool medical examination (table I). The preschool medical examination was able to identify children who later ran into educational problems but was too insensitive to identify accurately the 103 children we defined as having special needs (table II). Though social class alone as a screening test for later educational problems was both insensitive and non-specific, reading ability was related to a combination of sex and social class (table III), as has been found elsewhere.⁵ Girls from class I and II did significantly better than girls from class IV and V and than boys from class I and II. Part of our large difference could be

explained by postulating that the Edinburgh reading test's standardisation is inaccurate for girls from class I and II or simply that these girls are smarter than the boys.

Of the 267 children who failed their preschool medical examination, 159 failed because a new problem was discovered on this examination. Some children had more than one abnormality. Table IV looks at the results and outcomes. Of 159 children with 171 problems, 81 children were referred to medical specialists. Of these 81, 29 were said to be normal after their first hospital visit and a further 29 had been discharged from specialist care by the end of our study. Medical information was passed on to the teachers of only seven of the 159 children who failed their medical examination.

Only three children failed the developmental part of their preschool medical examination. One of these children was of very short stature, which caused her to be referred to a paediatric clinic, where her idiopathic hypercalcaemia was diagnosed. The two other children remain in mainstream schooling but need additional help.

Twenty two of the 23 children in schools specifically for children with severe and moderate learning difficulties were identified independently of any of their developmental screening. The mean age at which intervention started for the seven children with severe learning difficulties was 1 year 5 months (range 2 months to 3 years). Three had been recognised by health visitors, three within the hospital outpatient medical service, and one by the local opportunity group leader. The 16 children with moderate learning disorders were recognised by the age of 3 years 9 months (range 2 years 3 months to 6 years 6 months). Six were identified by the teacher of the nursery, five by the health visitor, two by the hospital outpatient medical service, one by the child's mother, one by a local senior clinical medical officer, and one by the playgroup leader.

We looked at the ages at which intervention started because the expected route for children with neuro-developmental problems is screening followed by a detailed assessment and then intervention. What seems to have happened in the group of 22 children is that the problem was recognised and intervention started; a detailed assessment was performed almost as an adjunct. That is not to say that the children missed out on assessments. All except one child had more than one assessment, but the initiation of therapy, and its content, did not depend on a detailed assessment of the child.

Despite being identified early and receiving medical and educational attention, all the children originally placed in schools for children with severe and moderate learning difficulties stayed in their original placements. Six out of the 80 children identified later and placed in mainstream schooling were in schools for children with moderate learning difficulties by the end of the study.

Discussion

Our results suggest that the medical usefulness of developmental screening tests by health visitors and general practitioners for identifying educationally important medical problems is small. Also, most children with special educational needs seem to be identified independently of their screening tests. As well, developmental screening in Somerset is an insensitive method for detecting children with special needs.

This retrospective cohort study of 1504 children shows that our system of regular developmental checks did not contribute significantly to the detection of later educational difficulties. Assuming that the results of

TABLE I—Results of preschool medical examination related to reading scores at age 7

Preschool medical examination	No of children	No of readers	Mean score on Edinburgh reading test* (95% confidence interval)	% (No) of non-readers at 7 years
Passed	785	751	105.1 (103.9 to 106.3)	4.3 (34)
Failed	267	236	102.5 (100.3 to 104.7)	11.6 (31)†
No result:				
Child moved into area	126	116	107.2 (107.2 to 110.0)	7.9 (10)
Child did not attend	54	51	100.5 (95.7 to 105.2)	5.6 (3)
Child not invited	155	134	104.7 (101.7 to 107.7)	13.5 (21)‡
Result not known	177	107	106.8 (103.3 to 110.0)	8.5 (10)

t=2.12, p<0.034 Between reading score and having passed or failed preschool medical examination.

*Standardised for age and sex; scored from 70 to 130.

†Non-readers who failed their preschool medical compared with those who passed: $\chi^2=17$; df=1; p<0.001.

‡Non-readers who were invited to a preschool medical examination compared with all those who were medically examined: $\chi^2=13$; df=2; p<0.001.

TABLE II—Effectiveness of screening for detecting children with special educational needs

	Children seen at age 7	
	With special education needs	No special education needs
<i>Assessed by general practitioner (preschool medical)</i>		
Fail (n=267)	34	233
Pass (n=785)	27	757
Sensitivity=56%		
Specificity=77%		
<i>Assessed by health visitor (3 year developmental)</i>		
Fail (n=132)	21	111
Pass (n=683)	26	657
Sensitivity=45%		
Specificity=86%		
<i>Assessed by both general practitioner and health visitor</i>		
Fail (n=71)	14	57
Pass (n=517)	14	503
Sensitivity=50%		
Specificity=88%		
<i>Social class*</i>		
IV, V, unemployed (n=291)	25	266
I, II, IIIN, IIIM (n=558)	29	529
Sensitivity=46%		
Specificity=66%		

*Registrar General's classification; father's occupation at birth of child taken from health visitor record, hospital notes, or birth record.

TABLE III—Relation of sex, social class, and reading scores

Social class	Boys		Girls	
	No	Mean reading score (95% confidence interval)	No	Mean reading score (95% confidence interval)
I, II	69	107.0 (103.7 to 110.8)	62	116.0 (113.3 to 119.2)*†
IV, V, unemployed	134	100.8 (97.4 to 102.9)	135	99.2 (95.5 to 101.6)

*Girls from social class I and II compared with girls from social class IV and V: t=8.36, p<0.001.

†Girls from social class I and II compared with boys from social class I and II: t=3.78, p<0.001.

TABLE IV—Number of new problems found on preschool medical examination, general practitioners' diagnoses of those referred to specialists, and outcome

	New problems	Referrals	Diagnosis	Treatment	Outcome			
					Normal	Unknown	Discharged	Followed up
Vision	59	30	Hypermetropia (n=1) Strabismus (n=8) Myopia (n=21)	Glasses Glasses Glasses	8 12 1		1 4	
Hearing	50	24	Reduced hearing Referred to ENT (n=15)	Grommets Decongestant Nose cauterised		5 2	9 1 1	1
Speech	24	13	Referred to audiology (n=9) Lisp Poor articulation Speech delay Referred to ENT Husky voice Language delay	Operations and speech therapy	3 1		2 2	4
Development	8	3	Global delay: Referred to paediatrician Referred to opportunity group	Special schooling Extra help in school				2 1
Physical	30	11	Systolic heart murmur Undescended testes Umbilical hernia Tight prepuce "Chesty" Small stature Flat feet	For asthma For idiopathic hypocalcaemia	2 1 1		1	2 1
							1	

preschool developmental screening should be related to the child's later educational achievement, why did we do so poorly?

Firstly, developmental screening at predetermined ages may be unrealistic. Parents go to general practitioners at irregular intervals⁵; most of our severely handicapped children with special educational needs were identified when someone was worried, and any developmental testing then confirmed developmental delay. This use of a formalised assessment of development as a check rather than as a screen is similar to the practice of primary care paediatricians elsewhere.⁷ Our survey of the 59 general practitioners caring for the children in this study supports this view: 36 of the 37 who replied thought that developmental screening revealed little that they did not already know about the child.

Secondly, our local developmental screening programme may set itself unrealistic goals. Screening for the conditions causing mental handicap that are curable, such as phenylketonuria or hypothyroidism, fulfils the World Health Organisation criteria for a screening test,⁸ but many other conditions causing mental handicap are incurable. Probably because of their rather non-specific targets developmental screening tests are often poorly validated,⁹ and this is compounded by the fact that most of the health visitors involved with these children used a mixture of developmental tests. So our results are hardly a surprise. To overcome this problem Somerset has started using the Denver developmental screening test as a screening instrument for all preschool children. This test is well validated¹⁰ and may lead to useful comparisons with the present system when Somerset education department changes to standard attainment targets in 1991 or 1992. General practitioners looking for measurable assessments of quality¹¹ within their own screening programme would obviously not have access to these sorts of external outcome measurements, and hence general practitioners and parents will not be able to judge how useful a particular developmental screening programme actually is.

Thirdly, we found that 22 out of 23 of the statemented children with learning difficulties were picked up independently of the screening programme. This implies that our screening procedures were largely peripheral to identifying children with learning difficulties. On the other hand, though only 22 children of the 103 with special educational needs had been identified before school entry, these were 96% of the most handicapped children—that is, those in special

schools. This emphasises the value of secondary identification pathways such as playgroups, opportunity groups, nurseries, parents, and health visitors.

Our findings and other evidence¹²⁻¹⁵ suggest that there may be more effective methods of looking at preschool children than with the increasing number of medically related screening tests that the government proposes¹⁶—for example, asking parents,^{17,18} opportunistically in the general practitioner's surgery,¹⁹ or through questionnaires.^{20,21} It may be worth while to review only certain groups of children. Whichever method is used, being able to assess it is essential.²² The short term difficulty with screening and assessment is that the proposed general practitioner contract contains no details about the frequency, content, or even the aims of preschool surveillance. Rather, it will be the responsibility of the district health authority to define the content, training, auditing, and accreditation of the general practitioners carrying out childhood surveillance.²³ Somerset Health Authority can effectively audit immunisation programmes by general practitioners and is currently looking at its preschool surveillance programme from the points of view of both health visitors and general practitioners. The other key conditions within the proposed schedule seem to show that there is a realistic move away from trying to define a child's developmental progress towards an attempt to audit measurable items, such as reviews of biochemical screening.

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Screening in Practice

Screening and surveillance of school aged children

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Three progressive moves seem to be taking place. Firstly, the white paper *Promoting Better Health*, through its encouragement of disease prevention and health promotion, accepts that much morbidity and premature mortality is behaviourally determined and therefore preventable. Secondly, the wish to move towards a true concept of primary health care in Europe, not a provision normally contained within traditional medical services, extends the role of the family doctor into that of an observer of patients throughout their lifespan.¹ This is one definition of surveillance: "The ongoing supervision of the preventive care of a practice population" (C R Hart, personal communication). Thirdly, individuals and their families are the nearest and often the best observers of deviation from normality, and as they are usually correct this latent resource should be exploited.²⁻⁶

Who needs observation?

Children from 5 years to school leaving, because they are developing and dependent on the ingredients of their environment, are especially vulnerable when some physical, emotional, or intellectual problem intrudes to interfere with social and educational progress. Environment, nutrition, and immunisation have radically changed the epidemiology of childhood; physical illness has been largely replaced by problems of communication, behaviour, and social inadequacy. If failure to achieve, school difficulties, drug and alcohol abuse, smoking, and adolescent problems (box) are to be predicted and prevented an accessible and responsive facility is required to give timely and effective help.⁷⁻¹⁰ This means listening to and taking seriously the anxieties of children, parents, and teachers and is the basis of the flexible and reactive model of school health services pioneered in Northumberland.¹¹ Initial assessment can be made by someone with an understanding of child development, the early indicators of dysfunction, and the available facilities for their management. Surely this includes the general practitioner.

Every child and the whole child

Community health departments have a responsibility to every child of school age living within the district, including those in families who move and are difficult to trace and those not registered with a general practitioner. A further statutory duty, resulting from

What can we prevent or modify?

Preschool indicators	At school	Later
Undervalued	Poor self esteem	Difficulties in relationships
Slow development of speech or language	Underachievement	Poor employment prospects
Poverty	Solvent abuse	Drug misuse Alcohol misuse (drink driving; accidents)
Emotional or behavioural difficulties	Behaviour problems School problems	Repeat in next generation Smoking
Family problems Child abuse		
	Smoking	

the 1981 Education Act, is the early identification of children with special needs. This is not restricted to formal education. It is intended to ensure that from the age of 2 years children with disabilities or handicaps that might affect their education are formally assessed and a statement prepared indicating the help required. The act relates to the 20% of children who at some time during their schooling will require special assistance.¹² Such children must be reviewed at least annually, and it is the duty of the local authority to coordinate this process and to include medical advice.

Particular problems

HEARING

The child with bilateral perceptive or sensorineural hearing loss will have been identified before school entry. The average age for first diagnosis has been reduced from 3½ years in 1978 to 11 months in 1988, which, although not ideal, should allow most of these children to achieve acceptable speech, language, literacy, and social expectations.

A much more common problem in the school years is conductive hearing loss due to middle ear disease, especially otitis media with effusion—"glue ear." Repeated screening of school children has not been shown to affect long term outcome of this impairment, and it is doubtful if this should be continued.¹³⁻¹⁵ Evidence for the long term effectiveness of available treatment is hard to find, and complications of treatment are not unknown.^{14 14a} This does not imply that it is unhelpful to know of the existence of partial

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