

Incorporating Developmental Screening and Surveillance of Young Children in Office Practice

SHARMILA B MUKHERJEE, SATINDER ANEJA, *VIBHA KRISHNAMURTHY AND *ROOPA SRINIVASAN

From Department of Pediatrics, Lady Hardinge Medical College & associated Kalawati Saran Children's Hospital, New Delhi, India; and Ummeed Child Development Center, Mumbai, India.

Correspondence to: Dr Sharmila B Mukherjee, Department of Pediatrics, Kalawati Saran Children's Hospital, Bangla Sahib Road, New Delhi 110 001, India. theshormi@gmail.com

Context: Developmental concerns voiced by parents need to be responded to by structured developmental screening. Screening is the use of validated developmental screening tools to identify children with high risk of developmental delay out of an apparently normal population, while surveillance is the process of monitoring children identified as high risk by screening. Absence of routine screening can be attributed to problems at the level of parents, pediatricians or National policies. Hence vulnerable children are not detected early, and are denied benefit from appropriate developmental interventions. There are no definite guidelines for screening or for suitable tools for screening and surveillance.

Objectives: To review existing developmental screening and monitoring tools for children validated in Indian under-five children, and provide a proposed practice paradigm for developmental screening in office practice.

Evidence Acquisition: Scientific papers were retrieved by an electronic database search using MeSH terms 'screening tool', 'developmental delay', and filter of 'children under 5 years'. Those relevant to office practice and validated internationally or in Indian children were reviewed.

Results: Screening tools applicable to Indian office practice have been compared and certain tools have been recommended according to the level of risk of developmental delay. An algorithmic approach to screening has been given along with strategies for incorporation.

Conclusions: Screening and surveillance for high risk of developmental delay are essential components of child health care. It is possible to incorporate both into routine practice.

Keywords: Children, Developmental delay, Screening, Surveillance.

Development is a continuous process that occurs normally in childhood, wherein skills are acquired in various inter-related developmental domains. It is intricately influenced by a combination of genetic, biological and psycho-social factors [1]. Pediatricians frequently face parental concerns regarding development and/or behavior [2]. Some of these issues may be transient and easily rectifiable but a small but significant proportion may actually be harbingers of neuro-developmental disorders.

The global prevalence of developmental delay in children is reported as 1-3%, while World Health Organization (WHO) estimates that 15% of the world's population lives with some form of disability [3,4]. There is a paucity of community-based data from lower and middle income countries (LMIC), but a similar or higher prevalence is expected [5]. Due to improving maternal and child health care and better neonatal and child survival, there is now a large group of children at high risk for developmental delay in these countries. In addition, the proportion of children experiencing poverty, ill-health,

malnutrition and lack of early stimulation – factors that adversely affect attaining optimum developmental potential – are much more in comparison to high income countries [1].

One of the main reasons for lack of community-based data from India is the absence of routine developmental screening and surveillance. Developmental surveillance is the longitudinal process of identification and monitoring of newborns and children at high risk [6]. This comprises of eliciting parental concerns, acquiring developmental history, identifying risk and protective factors, evaluation, and maintenance of records [7]. Screening is the brief cross-sectional process of evaluating children by screening tools with good psychometric qualities (sensitivity and specificity >70-80%), that have been norm-referenced and standardized on populations representative of the target population [5-7]. In developed countries, both strategies are core components of the health, education and social care systems [8]. The American Academy of Pediatrics (AAP) recommends developmental surveillance of high-risk children at each health visit from birth to 3 years, and routine screening of

low-risk children at 9, 18, and 24/30 months or earlier if concerns are elicited [7]. Screening for behavioral disorders and academic/learning disorders is also recommended [9]. Hix-Small, *et al.* [10] reported an increase in screening in USA after these guidelines were framed, though it is still far from ideal. Lack of screening means delay in detection, initiation of intervention, increased morbidity and parental anguish, more health service utilization and poorer prognosis [11].

Why Developmental Screening is not Routinely Practiced in India?

In India, there are multiple challenges to practice of universal developmental surveillance and screening. Parents are unaware of the existence and need of these services. Health care seeking is prioritized for acute illnesses which are not appropriate opportunities for screening. A heterogeneous population of doctors with variable proficiency caters to the health needs of Indian children. If parents express concerns, they are often given false assurances without proper appraisal. Well-child visits are primarily for immunization with a few perfunctory questions asked about development, if at all. This was documented in a study of perceptions and practices of 90 pediatricians from Gujrat [12]. Most participants (97.3%) reported parents expressing developmental concerns but only 13.6% used structured tools for evaluation. Reasons cited by those relying on informal assessment were time constraints (72%), non-availability of treatment or referral options (45%), and inability to use screening tools (28%). Contrary to this common misconception, informal evaluation has been proved unreliable in detecting developmental delay. Recognition is difficult in early childhood unless specifically looked for in a structured way, since changes in development are rapid, there is intra-domain overlap, and early indicators are often subtle.

At present, exposure and training in formal developmental screening and assessment is lacking in the post-graduate pediatric curriculum. Pediatricians may be cognitively aware but lack the necessary psycho-motor and communication skills to screen effectively. There is a scarcity of developmental pediatricians. Available assessment tools are mostly of international origin, which are expensive, not easily available, and require training and accreditation. Recommendations for developmental screening by the Indian Academy of Pediatrics (IAP) are yet to be formulated. Although the 'Persons with Disabilities Act, 1995' states that 'children should be screened annually to detect high risk cases', the process is not outlined [13]. In 2013, the '*Rashtriya Bal Swasthya Karyakram (RBSK)*' was launched by the Government of

India, which aims at screening for defects at birth, diseases, deficiencies and development delays including disabilities (4 D's) in children between 0 to 18 years [14]. It is envisioned that pre-school children will be screened by *Anganwadi* workers using age-appropriate developmental checklists in the periphery and the positive cases will be re-assessed by trained personnel at the secondary and tertiary care levels. Once this swings into action there will naturally be an upsurge of pediatric consultations by concerned parents, which will need to be tackled responsibly. Reviews of screening tools that may be used in LMICs are available but are hampered by lack of clear guidelines or practice algorithms [5,15,16].

This article aims at sensitizing pediatricians, reviewing certain general (not domain-specific) developmental screening and monitoring tools validated for use in Indian under-five children, and proposes an office practice paradigm.

DEVELOPMENTAL SCREENING TOOLS IN USE IN INDIA

Screening tools currently in use in India include those developed and validated in high-income countries, translations of the above in Indian languages, and indigenously developed tools. Each type has its own problems. In addition to the drawbacks outlined earlier, internationally acclaimed tools may not be suitable for our populations due to presence of items that are culturally alien or which lose context after translation. They also require validation on large reference groups comprising of healthy children of the target population without conditions averse to development like iron deficiency anemia, malnutrition, poverty, and decreased stimulation [17]. Translations may be understandable but still face the aforementioned drawbacks, unless validated. Indian tools are language and culturally suitable, have been validated but may not have optimal psychometric properties since most were originally developed largely for community surveys by health workers. Taking these aspects into consideration, a list of screening tools for developmental delay popularly in use or validated in Indian settings was compiled and those that could be administered by pediatricians in any office setting were reviewed. Tools screening for behavior problems or specific domains or overt disability were not included.

Analytically Comparing Tools for Development Screening

To be able to compare tools qualitatively, it is essential to understand their characteristics. **Table I** outlines the definitions and acceptable standards of commonly used psychometric parameters. These are important for

TABLE I DEFINITIONS AND ACCEPTABLE STANDARDS OF DEVELOPMENT TOOL RELATED PSYCHOMETRIC PROPERTIES

<i>Term</i>	<i>Description</i>	<i>Acceptable standard</i>
Standardization	The uniformity of procedure in administering and scoring the test exactly as outlined by the developer of the tool.	On representative population
Validity	The ability of a tool to assess what it is intended to assess in comparison with a gold standard diagnostic tool	70%
Sensitivity	Percentage of children with delay/ problem who are correctly identified by the screening test	70-80%
Specificity	Percentage of children without delay/ problem who are correctly identified by the screening test	≥80%
Positive Predictive Value	Percentage of children identified with delay/ problem by the screening test who do indeed have the delay/ problem	30-50%
Negative Predictive Value	Percentage of children identified as normally developing by the screening test who are indeed developing normally	
Reliability	How consistently similar results are obtained repeatedly	High/ strong-
Inter-rater	Result variability if test given by different interviewers	coefficients>0.60
Test-retest	Result variability when repeated later	

making educated decisions regarding quality. If screening tools are not used for their intended purpose (*i.e.* screening tools being used for diagnosis or in children outside the intended age range), reliability gets compromised. Choice of tools also differs according to level of risk for developmental delay; high-risk children being those with biological and/or environmental risk factors. Constituent items of tools may be historically based (milestones, opportunity-based skills), performance-based or both. In contrast to developed countries, parental interviews are not as reliable in LMICs due to poorer literacy levels, unawareness of milestones and possibility of socially acceptable responses being given due to associated social stigma [5,15,16]. Interpretation of a screening result as pass or fail is done by comparing with scores derived from standardized population norm-references or pre-decided performance criterion.

Deciding the Tool Best Suited for Indian Children

Hypothetically, an ideal screening tool for Indian children is a brief, inexpensive tool with good psychometric properties, available in Indian languages, comprising of purely developmental/culturally-adapted items, that has been validated on representative healthy Indian children and requiring minimal training [17]. Such a designer tool does not exist in reality; so each pediatrician has to make an educated choice best suited for individual practice. Developmental tools of international origin are compared in **Table II**. Only two of these have been validated in Indian children.

The Denver Developmental Screening Test (DDST) is

a very popular and frequently used international screening test [18-20]. However, its low specificity (43%) leads to over identification of false positives, parental apprehension, and burden on the system for diagnosis and intervention. Hence it is no longer considered appropriate for the purpose of screening. The Bayley Infant Neurodevelopmental Screen (BINS) has been used for monitoring children at moderate to severe high risk [21,22]. Though psychometric properties are acceptable, its drawbacks are lack of validation in Indian children and inability to screen children beyond 2 years of age. The Ages and Stages Questionnaire (ASQ) is a parent-completed questionnaire with acceptable properties [23]. In a study by Juneja, *et al.* [24], ASQ was validated against the Developmental Scale for Assessment of Indian Infants. After being translated into Hindi and substitution of a few culturally inappropriate items, this version of ASQ was administered to parents by an interviewer to screen children aged 4,10,18 and 24 months with both high and low risk. The overall sensitivity in detecting developmental delay was 83.3% (higher for the high-risk children), specificity 75.4% and negative predictive value 84.6%. ASQ has the potential to be used in India after being translated into local languages if interviewer-administration replaces parent-completion when required.

Studies in the West have shown that asking parents about development concerns is reliable for assessment [25]. Parent Evaluation of Developmental Status (PEDS) considers concerns as either 'not predictive' or 'predictive' of developmental disabilities. The latter categorizes children as having High, Moderate or Low risk of developmental disabilities. Each is linked with related

TABLE II COMPARISON OF DEVELOPMENTAL SCREENING TOOLS OF INTERNATIONAL ORIGIN

<i>Factors</i>	<i>Denver Developmental Screening Test II</i>	<i>Bayley Infant Neuro-developmental Screen (BINS)</i>	<i>Parents Evaluation of Developmental Status (PEDS)</i>	<i>Ages and stages questionnaire (ASQ)</i>	<i>Developmental* Profile II/III</i>
Age	0-6 years	3-24 month	0-8 years	1 -66 /3- 66 m	0-9 y/ 12 y11m
Format	Directly administered	Directly administered	Parent-report	Parent report	Parent report
Screens/ Domains	Expressive & receptive language, gross motor, fine motor, personal social	Neurological processes, expressive and receptive functions & cognitive	Cognitive, expressive & receptive language fine & gross motor, social-emotional, behavior, self-help & school	Communication, gross motor, fine motor, problem-solving, and personal adaptive skills	Physical, Self-help/ Adaptive, Social/ Social-emotional, Academic/ cognitive and Communication
Items	125	11-13	10	22-36	186/ 180
Scoring/ Result	Risk category: normal/ abnormal/ questionable	Risk category: high/ low moderate	Risk category: low/ medium/ high	Pass/fail scores	Total score gives domain wise age equivalents
Time	10-20 min	10 min	2-10 min	10-15 min	10 /20-40 min
Language	English, Spanish	English	English	English, Hindi	English
Psychometric properties	Sensitivity 0.56-0.83 Specificity 0.43-0.80	Sensitivity 0.75-0.86 Specificity 0.75-0.86	Sensitivity 0.74-0.79 Specificity 0.70-0.80	Sensitivity 0.70-0.90 Specificity 0.76-0.91	Validity Coefficients* 0.52-0.72
Validated in India	Not validated	Not validated	Sensitivity 62% Specificity 65%	Sensitivity 83.3% Specificity 75.4%	Not validated but used extensively
Cost	\$111	\$325	\$30	\$249	\$240
Access site	http://www.denverii.com/	www.pearsonassessments.com	www.pedstest.com	www.brookespublishing.com/asq	www.wpspublish.com

*Internal consistency: 0.89-0.97 and Test-retest reliability: 0.81-0.92

management protocols: referral, more screening or continued surveillance, respectively. PEDS has been found reliable in other developing countries; however, there is limited literature from India [19,26,27]. The only available study from India was by Malhi, *et al.* [28] in which it was compared with Developmental Profile II (DP II) and Vineland Social Maturity Scale. Psychometric properties were found to be sub-optimal. The authors suggested that PEDS could be used to identify children requiring in-depth screening in situations involving time constraints. The limitations of this study were use of another screening tool as gold standard and a small sample size. Further research is warranted before its value in the Indian context is clarified [5,15]. Developmental Profile III is an updated version of DP II that screens for developmental delay in five key areas [29,30]. Its norms are based on a large representative sample of typically developing American children. Although used in India frequently in numerous research studies, it is yet to be validated in Indian children.

Indian screening tools, that were designed for community surveys but can be used for office practice, are

compared in **Table III**. These are easy to perform and interpret, inexpensive, and have been norm-referenced and standardized in representative populations. The main drawback is less than acceptable psychometric properties. Normative data of both Baroda Developmental Screening Test (BDST) and Trivandrum Developmental Screening Chart (TDSC) are derived from the Bayley Scales of Infant Development (BSID) which has not been re-validated since its inception more than 20 years ago [31]. The same drawback lies in the Indian Council Medical Research Psychosocial Developmental Screening Test (ICMR-PDST) [32,33]. In the TDSC validation study, the gold standard that was used was not a diagnostic tool but DDST (no longer considered suitable): so the results may be considered questionable until re-validated against a more robust gold standard [34].

Development Screening Tools of the Future

Two promising screening tools may become available for use in the near future. The first – Guide for Monitoring Child Development (GMCD) – is a parental report-based development monitoring tool for children between 0 to

TABLE III COMPARISON OF INDIAN DEVELOPMENTAL SCREENING TOOLS

Factors	Baroda Developmental screening Test (BDST) [24]	Trivandrum Developmental Screening Chart (TDSC) [25]	ICMR Psychosocial developmental screening Test [27, 28]
Developed from	Bayley Scales of Infant Development, Normative data from Indian children	Bayley Scales of Infant Development (Baroda Norms)	Programme for Estimating Age-related Centiles Using Piece-wise Polynomials* Normative data from Indian children
Age	0 - 30 mo	0 - 24 mo	0-6 y
Format	Directly administered 54 items	Directly administered 17 items	Parent interview 66 items
Domains	Motor and Cognitive	Mental and Motor	Gross Motor, Vision & Fine motor, Hearing, language & concept development, Self Help & Social skills
Scoring/ Result	Age equivalent and developmental quotient calculated	Within age range	3rd, 5th, 25th, 50th, 75th, 95th & 97th centiles given Significant delay < 3 rd centile (2 S.D)
Training	Minimal training	Minimal training	None
Setting	Community/ office	Community/ office	Community/ office
Time taken	10 min	5 min	Minimal
Psychometric properties	Sensitivity: 65-93%, Specificity: 77.4-94.4% PPV: 6.67-34.37%	Sensitivity: 66.8%, Specificity: 78.8%	Not given
Access site & Cost	Promila Phatak, Department of Child Development, University of Baroda, India. Inexpensive	MKC Nair, Child Developmental Centre Trivandrum, Kerala, India. Inexpensive	ICMR, Free

ICMR: Indian Council of Medical Research, PPV: Positive Predictive value; * Child Health and Development, Maternal and Child Health and Family Planning, Geneva, 1992.

3.5 years originally developed in Turkey [8]. It comprises of 7 items pertaining to developmental concerns, and takes 5-10 minutes to administer. The sensitivity and specificity are 86% and 93%, respectively. It also has an intervention package that helps in supporting normal development and managing developmental difficulties. A five-year project 'Development of International guide for monitoring child development' is currently underway in India, Turkey, Argentina and South Africa since 2010 [5]. The aim of this project is to standardize GMCD for universal use in children irrespective of demographic, cultural or linguistic considerations. The project also aims at examining an approach in which monitoring is done at community health clinics by trained personnel.

The second new kid-on-the-block is the INCLEN Neurodevelopmental Screening Test (NDST) that was developed by the composite efforts of a team of neurodevelopmental experts from India and abroad. It screens for 10 neurodevelopmental disorders (NDD): Autism Spectrum Disorders, Learning Disorder, Attention Deficit

and Hyperactivity Disorder, Vision Impairment, Hearing Impairment, Intellectual Disability, Speech and Language Disorders, Epilepsy, Cerebral Palsy and other Neuro-Muscular Disorders. Diagnostic criteria (Consensus Clinical Criteria) have been developed for establishing each diagnosis which are sequentially applied according to an algorithm when the screening test is positive [35]. Application of the NDST in a recently concluded multi-centric validation study in rural, urban, hilly and tribal areas revealed that the prevalence of ≥ 1 NDD in children aged 2-9 years ranged between 7.5-18.5% [36].

DEVELOPMENTAL SCREENING IN OFFICE PRACTICE

Setting up routine screening practice involves creating parental awareness and demand, finding the right opportunity, tool selection, acquisition and training in administration, scoring, interpreting results and counseling. This entails planning when, where, and how screenings will be accomplished, devising a method for documenting observations and maintaining records, communicating results to parents, referring to experts for

further evaluation when required and scheduling future screenings. Parents can be sensitized by information pamphlets and office displays. Since visits for acute illnesses are not appropriate opportunities; a practical option would be to club screening with pre-existing scheduled visits like immunization and vitamin A prophylaxis. A system needs to be devised to document results, maintain and update records at subsequent visits. Comparison with previous records helps to recognize potential developmental problems or regression, deviancy or dissociation. Experience from other countries has shown that time actually gets saved since it takes the same time that would otherwise have been spent in unstructured questioning and answering other parental queries. Ultimately evaluation time becomes predictable, detection rate increases, parent and provider satisfaction level increases and office attendance increases as parents start appreciating the monitoring process.

An Algorithmic Approach to Developmental Screening

Based on the advantages and drawbacks of the tabulated tools and until consensus statements are formulated by expert groups, the authors suggest a potential practice paradigm for pediatricians based on degree of risk of developmental delay (**Fig. 1**). Preliminary steps involve creating awareness, procuring tools according to the type of patients encountered (low-risk, high-risk or both), and achieving competency in administration, scoring and interpretation. The schedule of screening and follow up monitoring will differ according to level of risk.

Discussing Parental Concerns and Test Outcomes

Parental concerns should always be asked. In the initial visit, if the parent of a low risk child expresses developmental concerns, the pediatrician is expected to discuss these with the parents and offer options of more frequent and earlier monitoring (as in the high risk group) or referral for an in-depth evaluation even if the screen is negative. If the parents opt for the former and the concerns persist at the next visit, immediate referral is warranted. If not, monitoring should continue as for the high-risk group. In this group, the first visit recommended by AAP is 4-6 months (coinciding with the 2nd or 3rd immunization visit). The corresponding immunization visit in India would be at 3.5 months. At this age, a small proportion of infants display transient benign tone abnormalities that may be mistaken as pathological. In these instances, the pediatrician should make a note in the child's records and schedule a repeat visit after a month, without unduly alarming the parents. If it persists, in-depth evaluation would be required.

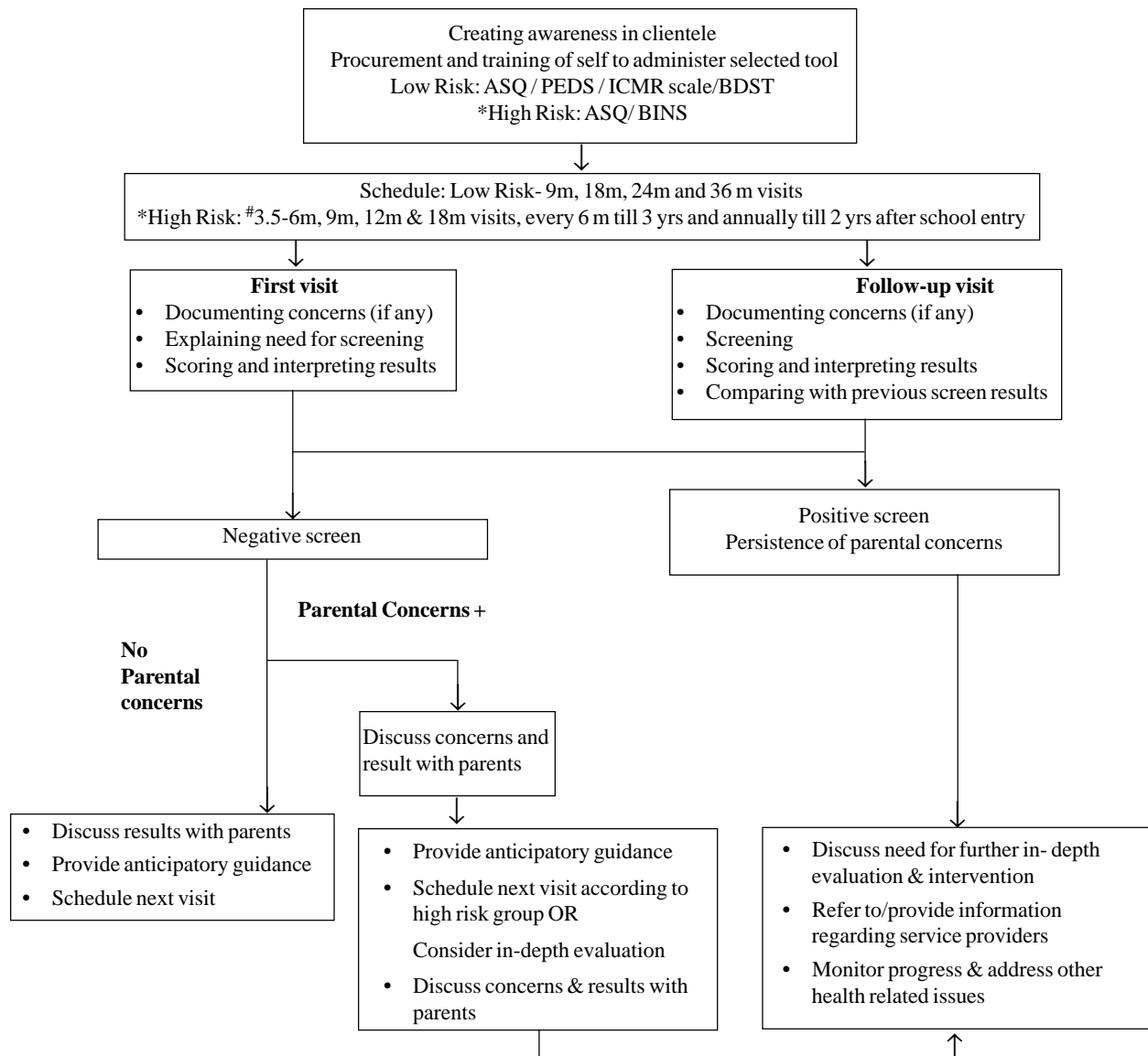
Once screening is complete, it is important to

properly convey the significance of the results. If negative, parents should be reassured that development is currently appropriate, anticipatory guidance should be given about expected milestones and the necessity of returning for the next screening visit should be explained and scheduled. If positive, the implications need to be discussed in depth with the parents, and they should be counseled about the need of diagnostic evaluation and start of stimulation or intervention as indicated post evaluation. Since parents have intrinsic faith in us as health care providers of their children, it is our moral responsibility to be instrumental in arranging referrals (by providing contact details or direct communication) as well as providing continual medical help and moral support. It is good practice to develop a two-way communication system with service providers to instill confidence in parents regarding management issues.

Screening should be considered the initial step of intervention services [37]. Unfortunately, it is common practice to falsely reassure or delay referral to alleviate parental anxiety. Actual practice should be 'Refer not defer.' Failing to refer for diagnosis and intervention after detection on screening is considered unethical [38]. In developed countries, a referral rate of 1/6 children screened is considered optimal [39]. It is important to understand that starting multi-disciplinary intervention (speech and language therapy, occupational therapy, physical therapy, special educational services, etc) should proceed in parallel to diagnosis-establishment and not afterwards. In addition to formal intervention, pediatricians must become familiar with home-based intervention strategies that should be shared with the parents. Development oriented packages have been combined with tools like 'Integrated Management of Child Illnesses – Care for Development' (WHO/UNICEF), GMCD, TDSC and Developmental Assessment Tool for Anganwadis (DATA) or are already in practice at the community level via National Rural Health Mission, RBSK, Integrated Child Development Schemes, and other agencies, the details of which are available, can be practiced by parents at home, and have been proven to be beneficial [8,14,34,40-45].

CONCLUSIONS

Many parents and children struggle in their daily lives due to problems arising from undetected development delay. Considering the widespread prevalence of developmental problems, the pediatrician must remain vigilant. By adopting developmental screening and surveillance, one can ensure a systematic approach to children with developmental concerns and help improve their future. Both strategies are integral parts of child healthcare,



**Neonates, Infants or children with ≥1 High risk factors viz., Genetic: positive family history of illness associated with neurodevelopmental morbidity; Biological: acute & chronic illnesses, nutritional (macro & micro) deprivation; Environmental: exposure to poverty, violence, neglect, teratogens, arsenic, lead, drugs, etc.; Psycho-social: illiteracy, lack of stimulation, learning opportunities, poor parenting skills, parental illness or substance abuse, maternal depression, etc.; Presence of any parental concerns regarding development. #Abnormality present at 3.5 months: refer to text (discussing parental concerns & test outcomes).*

FIG.1 Proposed schema of office based developmental screening and surveillance.

benefit the individual child and society, and also protect the doctor from possible future litigation. In this review, an attempt has been made to sensitize colleagues to the importance of screening and surveillance, compare existing screening tools and propose those suitable for Indian children along with strategies for incorporation into office practice. There is a strongly felt need to develop more culturally appropriate, norm-based, valid and

reliable Indian developmental screening instruments. We strongly urge that a consensus be formulated at the National level by experts on appropriate developmental surveillance and screening recommendations. Ultimately, earlier recognition of developmental delay results in better inclusion of affected individuals in society, establishment of prevalence data, educated health policy decisions, and resource allocation at the Government level.

Contributors: SBM: devised the review paper concept and will stand as guarantor. All authors helped in the literature search and selection of articles appropriate for the purpose of the review; SBM: drafted the manuscript with critical inputs from SA, VK and RS. All authors approved the final manuscript.

Funding: None; *Competing interests:* None stated.

REFERENCES

1. Grantham-Mc Gregor S, Cheung YB, Cueto S, Glewwe P, Richter L, Strupp B, *et al.* Child development in developing countries: Developmental potential in the first 5 years for children in developing countries. *Lancet*. 2007;369:60-70.
2. Lynch TR, Wildman BG, Smucker WD. Parental disclosure of child psychosocial concerns: relationship to physician identification and management. *J Fam Pract*. 1997;44:273-80.
3. Bellman M, Byrne O, Sege R. Developmental assessment of children. *BMJ*: 2013: 346:e8687.
4. World Health Organization, World Bank. World report on disability. Geneva, World Health Organization, 2011. Available from: URL:http://www.who.int/disabilities/world_report/2011. Accessed January 15, 2014.
5. Krishnamurthy V, Srinivasan R. In: Childhood Disability Screening Tools: The South East Asian Perspective. A Review for the WHO Office of the South East Asian Region. Mumbai. WHO, 2011.
6. Dworkin PH. British and American recommendations for developmental monitoring: the role of surveillance. *Pediatrics*. 1989;84:1000-10.
7. Council on Children with Disabilities, Section on Developmental Behavioral Pediatrics, Bright Futures Steering Committee, Medical Home Initiatives for Children with Special Needs Project Advisory Committee. Identifying infants and young children with developmental disorders in the medical home: an algorithm for developmental surveillance and screening. *Pediatrics*. 2006;118:405-20.
8. Ertem IO, Dogan DG, Gok CG, Kizilates SU, Caliskan C, Atay G, *et al.* A guide for monitoring child development in low- and middle-income countries. *Pediatrics*. 2008;121:e581-89.
9. Macias MM, Lipkin PH. Developmental surveillance and screening: refining principles, refining practice. How you can implement the AAP's new policy statement. *Contemp Pediatr*. 2009;26:72-76.
10. Hix-Small H, Marks K, Squires J, Nickel R. Impact of implementing developmental screening at 12 and 24 months in a pediatric practice. *Pediatrics*. 2007;120:381-9.
11. Radecki L, Sand-Loud N, O'Connor KG, Sharp S, Olson LM. Trends in the use of standardized tools for developmental screening in early childhood: 2002-2009. *Pediatrics*. 2011;128:214-19.
12. Desai PP, Mohite P. An exploratory study of early intervention in Gujrat State, India: Pediatricians' perspectives. *J Dev Behav Pediatr*. 2011;32:69-74.
13. Persons with Disabilities (equal opportunities, protection of rights and full participation) Act, 1995. Part II, section 1 of the Extraordinary Gazette of India, Ministry of Law, Justice and Company affairs (legislative department). Available from: URL: <http://socialjustice.nic.in>. Accessed December 27, 2013.
14. National Rural health mission, Ministry of Health and Family Welfare, Government of India. Rashtriya Bal Swasthya Karyakram (RBSK) Child Health Screening and Early Intervention Services Under NRHM: Operational Guidelines. Nirman Bhavan, New Delhi. 2013.
15. Robertson J, Hatton C, Emerson E. The identification of children with or at significant risk of intellectual disabilities in low and middle income countries: a review. CeDR Research Report. 2009:3
16. Fernald LCH, Kariger P, Engle P, Raikes A. Examining Early Child Development in Low Income countries: A Toolkit for the Assessment of Children in the First Five Years of Life. World Bank Human Development Group. 2009
17. Lansdown RG. Culturally appropriate measures for monitoring child development at family and community level: A WHO collaborative study. *Bull World Health Organ*. 1996;74:283-90.
18. Glascoe FP, Byrne KE, Ashford LG, Johnson KL, Chang B, Strickland B. Accuracy of Denver II in development screening. *Pediatrics*. 1992;89:1221-5.
19. Glascoe FP, Byrne KE. The accuracy of three developmental screening tests. *JEI* 1993; 17:268-379.
20. Frankenburg WK, Dodds J, Archer P, Shapiro H, Bresnick PB. Denver II: A major revision of re-standardization of Denver Developmental Screening Tool. *Pediatrics* 1992; 89:91-7.
21. Aylward GP. The Bayley Infant Neuro-developmental Screener. San Antonia, Tex: Psychological Corporation 1995.
22. Macias MM, Saylor CF, Greer MK, Charles Jm, Bell N, Katikaneni LD. Infant screening: the usefulness of the Bayley Infant Neurodevelopmental Screener and the Clinical Adaptive Test/Clinical Linguistic Auditory Milestone Scale. *J Dev Behav Pediatr*. 1998;19:155-61.
23. Bricker D, Squires J, Potter L. Revision of a parent completed screening tool: Ages and Stages Questionnaires. *J Pediatr Psychol*. 1997;32:313-28.
24. Juneja M, Mohanty M, Jain R, Ramji S. Ages and Stages Questionnaire as a screening tool for developmental delay in Indian children. *Indian Pediatr*. 2012;49:457-61.
25. Majnemer A, Rosenblatt B. Reliability of parental recall of developmental milestones. *Pediatr Neurol*. 1994;10:304-8.
26. Glascoe FP. Parents concerns about children's development: pre-screening technique or screening test. *Pediatrics*. 1997;99:522-8.
27. Pritchard MA, Colditz PB, Beller EM. Parents evaluation of developmental status in children with a birthweight of 1250 gm or less. *J Paediatr Child Health*. 2005;41:191-6.
28. Malhi P, Singhi P. Role of Parents Evaluation of Developmental Status in detecting developmental delay in young children. *Indian Pediatr*. 2002;39:271-5.
29. Alpern G, Boll T, Shearer M. Developmental Profile II (DP II). Los Angeles: Western Psychological Services;1986.

30. Developmental Profile 3rd Ed. Revised and updated. An Accurate and an Efficient Means to Screen for Development delays. Los Angeles: Western Psychological Services;2004.
 31. Phatak AT, Khurana B. Barado Developmental Screening Test for infants. *Indian Pediatr.* 1991;28:31-7.
 32. Vazir S, Naidu AN, Vidyasagar P, Landsdown RG, Reddy V. Screening Test for Psychosocial development. *Indian Pediatr.* 1994;31:1465-75.
 33. Malik M, Pradhan SK, Prasuna JG. Screening for psychosocial development among infants in an urban slum of Delhi. *Indian J Pediatr.* 2007;74:841-5.
 34. Nair MK, George B, Lakshmi S, Haran J, Sathy N. Trivandrum developmental screening Chart. *Indian Pediatr.* 1991;28:869-72.
 35. Gulati S, Aneja S, Juneja M, Mukherjee S, Deshmukh V, Silberberg D, *et al.* INCLLEN diagnostic tool for neuro-motor impairments (INDT-NMI) for primary care physicians: Development and validation. *Indian Pediatr.* 2014;51:613-9.
 36. Silberberg D, Arora N, Bhutani V, Durkin M, Gulati S. Neuro-developmental disorders in India – An INCLLEN study. *Neurology.* 2013;80:IN6-2.001.
 37. Early Headstart National resource Centre. Developmental Screening, Assessment and Evaluation: Key Elements for Individualizing Curricula in Early Headstart Programs. Available from <http://www.zerotothree.org>. Accessed December 27, 2013.
 38. Perrin E. Ethical questions about screening. *J Dev Behav Pediatr.* 1998;19:350-2.
 39. Glascoe FP. Screening for developmental and behavioral problems. *Dev Disabil Res Rev.* 2005;11:173-9.
 40. Department of Child and Adolescent Health Department, WHO. IMCI Care for Development. Available from: http://www.who.int/maternal_child_adolescent_health. Accessed November 19, 2013.
 41. Nair MKC, Russell PS, Rekha RS, Lakshmi MA, Latha S, Rajee K, *et al.* Validation of Developmental assessment Tool for Anganwadis (DATA). *Indian Pediatr.* 2009;46:S27-35.
 42. D. Landis, J.M. Bennett, M.J. Bennett, editors. *Handbook of Intercultural Training. 3rd ed.* Thousand Oaks, CA: Sage Publications; 2004.
 43. Nair MKC. Early stimulation CDC Trivandrum Model. *Indian J Pediatr.* 1992;59:662-7.
 44. Nair MKC. Early Child Development - Kerala Model. Global Forum for Health research, Forum 3 Geneva: WHO 1999.
 45. World Health Organization, UNICEF. Counsel the Family on Child Development-Counseling Cards. Available from: <http://www.unicef.org/earlychildhood>. Accessed December 27, 2013.
-