A Developmental Systems Model for Early Intervention

The article presents a rationale for and components of a developmental systems model to guide early intervention programs for vulnerable children and their families. Core principles emphasizing a developmental framework, integration, and inclusion, as well as related principles, are expressed in the context of a multicomponent interactive system. A central organizing feature of the model is its focus on maximizing family patterns of interaction by addressing potential stressors related to risk and disability conditions. It discusses the importance of consistency across the model's conceptual framework, knowledge based on developmental and intervention science, and professional practices and experience. Key words: *core principles, developmental framework, early intervention systems, research to practice*

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THIS IS A CRITICAL time in the history of the field of early intervention. There now exist unprecedented numbers of vulnerable children and families confronted with a remarkably diverse and challenging array of risk factors and developmental disabilities.[1] At the same time, our knowledge regarding the scientific foundations of early childhood development has grown substantially,[2] new conceptual models of child development have emerged or been refined that have direct relevance to vulnerable children and their families,[3–6] research studies have advanced our understanding of the effects and current limits of early interventions,[7] and recommendations for practice have been put forward by organizations and committees based on well-articulated principles, consensus expert opinion, and available empirical evidence.[8–10]

Perhaps, in part, as a consequence of the pace of these advances, what is missing is a comprehensive early intervention system of community-based services and supports that is capable of both addressing the diversity of risk factors and disability conditions and incorporating the conceptual, empirical, and practical knowledge now available. To be sure, outstanding models or, more specifically,

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model components can be found in individual communities, but this process is not yet widespread nor well developed.[11] Establishing a comprehensive model that is explicitly designed to integrate the complex elements that constitute an early intervention system is clearly a daunting task, especially given the diversity and complexity of the needs of children and families. Moreover, it can be argued that no one system can or should exist, as any approach must select among competing values, priorities, and even the knowledge base regarding how development proceeds and the mechanisms through which early interventions exert their influence on child development and family functioning. These are legitimate issues, and any model system must therefore make its approaches and biases as explicit as possible.

Accordingly, this article outlines the essential features of the developmental systems model designed to provide a framework for community-based early intervention services and supports for vulnerable children and families. In many respects, what follows is a direct extension of a conceptual framework presented previously[5] now applied to community-based systems of practice. A set of core principles is first articulated followed by a description of model components, their justification, and suggestions for communities wishing to incorporate model components into their early intervention system. Throughout the model's development, consistency was sought among the principles and related values that guided the system's design, the knowledge provided by both developmental science and intervention science, and practical issues of service provision.[12]

CORE PRINCIPLES

Developmental framework

The first and most fundamental principle of the developmental systems model is that all components are best organized within a developmental framework. The specific developmental framework presented here is one that has been directly linked to the main components of early intervention practice in a comprehensive approach relevant to children at risk for and those with established disabilities.[5,13,14] In particular, experientially based child developmental outcomes are governed by three family patterns of interaction. The first is the quality of parent-child transactions, which represents well-established relationship constructs involving parental sensitivity, reciprocity, level of intrusiveness, discourse aspects, affective warmth, and others. The second family pattern of interaction relates to family-orchestrated child experiences that include a range of parent-initiated and -directed activities such as providing the child with developmentally appropriate toys, introducing the child to the family's social network, helping to organize a network of peers for the child, selecting day care, or arranging community experiences that are consistent with the child's special interests or special needs. Providing for the child's health and safety in the form of proper nutrition, immunizations, and protection from violence, among others, constitutes the third and final family pattern of interaction governing child developmental outcomes.

Biologic risk and established disability

As illustrated in Fig 1, it is suggested further that when a child is born into a family who is at biologic risk for a disability or has an established disability, stressors associated with the child are often created that, if of sufficient magnitude, can disrupt existing levels of the three family patterns of interaction. In turn, child development will be compromised.

Four categories of potential stressors have been identified, each linked to family patterns of interaction.[5] These are information needs of families (eg, implications of a diagnosis, how to understand their child's uneven development), interpersonal and family distress (eg, rethinking family priorities, shared stigma), resource needs (eg, respite care), and confidence threats (eg, ability to effectively carry out parenting role). Accordingly, within this framework, early intervention programs capable of addressing these stressors will promote optimal levels of family patterns of interaction and, therefore, child development. Indeed, effective early

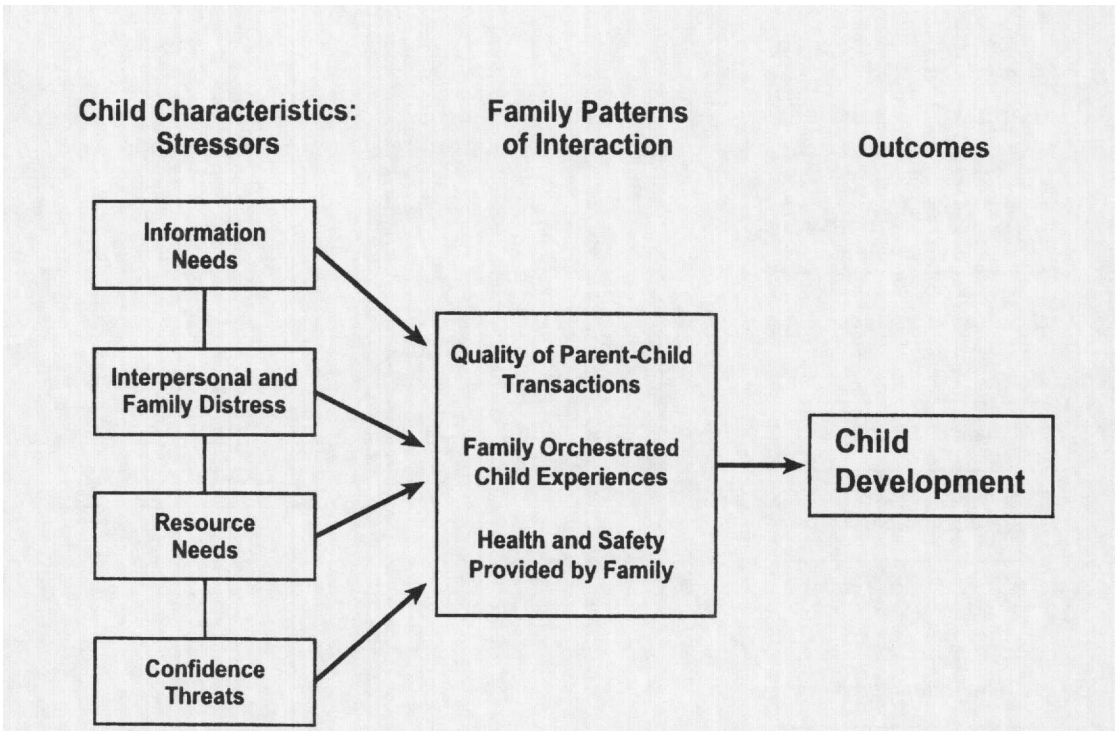

Fig 1. The relationships among potential stressors on families due to child characteristics, family patterns of interaction, and child developmental outcomes for children at biologic risk or those with established disabilities. *Source:* Adapted with permission from Michael J. Guralnick, "Early Childhood Intervention: Evolution of a System," in *Mental Retardation in the 21st Century*, M Wehmeyer and JR Patton, eds., Pro-Ed, © 2000.

intervention programs appear to be those that, while working in partnership with families, are able to organize a set of resource supports (eg, coordination of services, financial assistance), social supports (eg, parent-to-parent groups, counseling), and information and services (eg, home-/center-based programs, anticipatory guidance) adjusted to a family's unique pattern of stressors.[5] Consequently, as will be seen, for children at biologic risk and those with established disabilities, the developmental systems model is explicitly organized to be compatible with this understanding of the developmental mechanisms that can influence child developmental outcomes and how the early intervention system can most effectively address the stressors facing families.

Environmental risk

In addition to stressors that result from a child at biologic risk or with an established disability, numerous nonoptimal family characteristics also can function as stressors and render less optimal the same three family patterns of interaction. Fig 2 illustrates this. Personal characteristics of parents (eg, poor mental health; limited intellectual ability; or non-developmentally promoting, intergenerationally transmitted child-rearing attitudes and practices), financial resources (eg, minimal disposable income), and social supports (eg, disruptive marital relationship; the absence of supportive family, friend, and community networks), as well as individual child characteristics (eg, temperament) constitute the main categories of stressors associated with family characteristics. These stressors, or environmental risk factors as they are often called, become more and more damaging as a consequence of their cumulative impact.[15] Nevertheless, the early intervention response to address these stressors as presented here is to create an array of

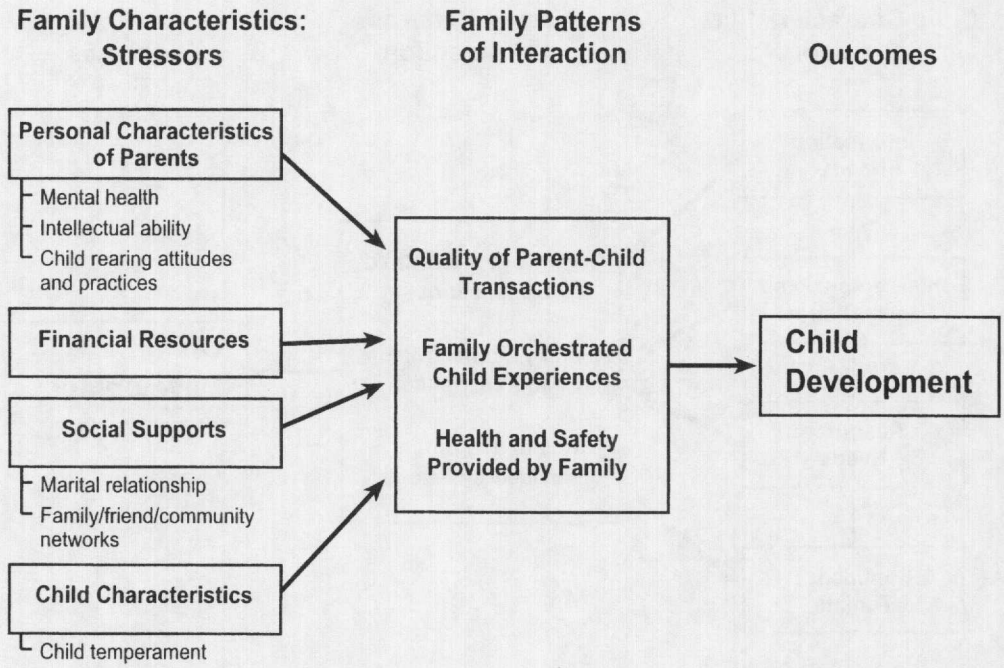

Fig 2. The relationship among potential stressors due to family characteristics, family patterns of interaction, and child developmental outcomes for children at environmental risk.

resource supports, social supports, and information and services similar to those discussed for children at biologic risk or with an established disability, again properly adjusted to the family's unique pattern of stressors. In this way, the framework for all risk and disability groups may be the same, but the approach allows interventions to differ radically based on individual needs.

Consequently, the developmental systems model is organized to address stressors generated by either child or family characteristics as well as the effects of stressors resulting from their joint occurrence. In either case, the model is unequivocally centered on families, attempting to strengthen a family's abilities to interact most effectively with their child, to orchestrate community experiences that will maximize their child's development and well-being, and to ensure that their child's health and safety will be adequately protected.

Integration

A second core principle of the developmental systems model relates to integration. As will be discussed, for virtually every component of the developmental systems model numerous professional disciplines, often representing different administrative structures and agencies, are involved. These circumstances produce pressures that serve to fractionate services and supports and constitute barriers to a comprehensive, well-coordinated, and well-integrated system.[16] It also exerts pressure to perceive child development as the product of parallel domains rather than of an interacting and organized set of developmental processes. Moreover, integration is the foundation for collaborative efforts, particularly collaboration involving families.[17]

Consequently, it is essential that, within the developmental systems model, integration occur at

every level. First, a thoughtful integrated process involving a comprehensive interdisciplinary assessment component for diagnostic and program planning purposes is necessary, and corresponding principles and practices have been well established.[18] Second, integration is essential for the assessment of stressors themselves and the development of a comprehensive intervention plan. These tasks may require the direct or indirect involvement of specialists from health, child development, early childhood special education, and social work, among others. Well-established principles and practices relevant to this level of integration also are available.[19] The third level of integration occurs during the implementation of the comprehensive intervention plan. Alternatives to the separate provision of therapeutic services by specialists, which are often duplicative and inefficient, have now emerged that seek to integrate various therapies. Collaborative consultation approaches in particular appear to be quite viable, by coordinating and blending discipline-specific resources in the context of naturalistic activity routines.[20]

Finally, it is unlikely that full and meaningful integration can occur at all in the absence of integration at the systems level itself.[11] A continuum of approaches can be considered to foster systems-level integration ranging from a radical restructuring of the multiple systems currently serving children and families to a thoughtful system involving collaborative agreements among all those currently involved. The significance of efforts to address this issue cannot be overly emphasized, as it is difficult to imagine that a system based on a developmental framework can be effective without well-designed mechanisms that promote integration.

Inclusion

The third and final core principle is that of inclusion. Inclusion, in many aspects not dissimilar to integration, is an increasingly accepted principle, value, and practice but one that has been difficult to implement effectively. Most communities have nevertheless made good faith efforts to provide supports and services in natural environments and to maximize the participation of children and families in typical community activities, including day care and preschool programs. Available evidence suggests that these efforts are appropriate in that well-designed inclusion programs can meet the needs of children and families involved without disrupting the integrity of a program's model (ie, programs are feasible), that adjustments can be made such that children fare well in terms of developmental and social outcomes, and that reasonable levels of social integration occur for many children.[21]

As in the case of integration, different philosophies and administrative structures as well as professional training issues are among the barriers to expanding inclusive options for children. This is particularly apparent when developing and implementing comprehensive intervention programs. Fortunately, communities have been hard at work at the process of building inclusive communities and a number of effective approaches are available.[22] At virtually every level, then, including service agencies, local community organizations, and individual school districts, the principle of inclusion must be agreed on as well as practices developed consistent with those principles.

DEVELOPMENTAL SYSTEMS MODEL

In the following sections, each of the major components of the developmental systems model is described containing both decision points (represented by diamonds) and specific activities (represented by rectangles; see Fig 3). As discussed, this model was designed to capture the developmental forces at work (stressors associated with family characteristics, stressors associated with child biologic risk and disability conditions, and family patterns of interaction), and the response by the early intervention system to minimize these stressors (providing resource supports, social supports, and information and services). The three core principles are embedded in all of the components, but other important principles and practices can be identified and will be discussed as the model is more fully described.

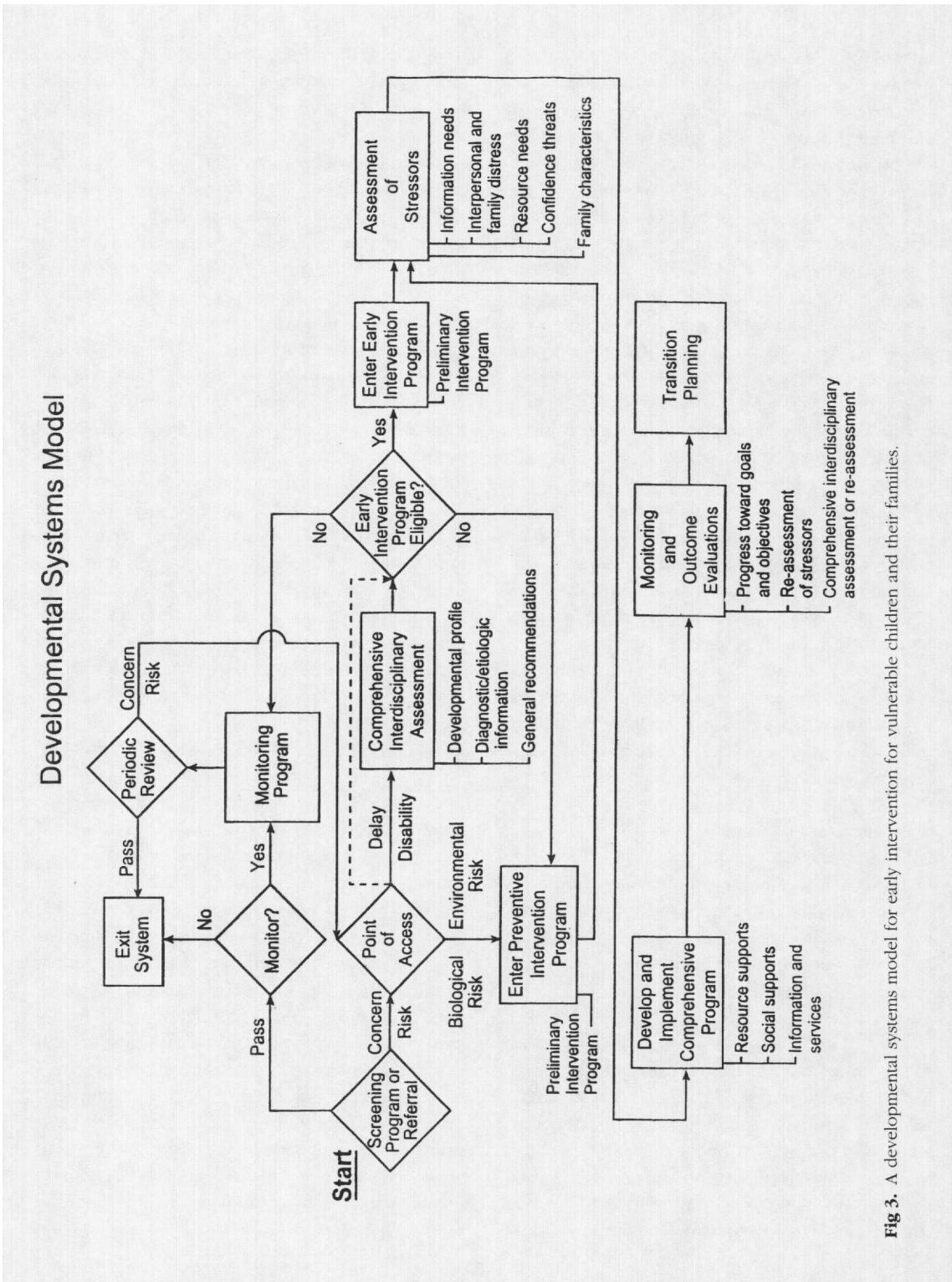

Fig 3. A developmental systems model for early intervention for vulnerable children and their families.

Each component of the model illustrated in Fig 3 is summarized below followed by brief suggestions for communities interested in adding or refining a specific component as part of their early intervention system. The sections on "What Needs To Be Done" under each component illustrate that the developmental systems model constitutes only one step in a process of development and refinement, the details of which remain to be established. Nevertheless, as argued earlier, a coherent conceptual framework and knowledgebase are now available that can indeed substantially reduce the discrepancy between what we know and what we do in the field of early intervention.

Screening and referral

Children and families first enter the system through a process of screening or referral. Parents may initiate the screening process, reflecting their concerns about their child's development, but physicians, child care workers, or others close to the family also may suggest that parents seek additional information. Developmental screening in some formal way is occasionally carried out in health care settings, and a few communities even have a process of universal screening. More often, however, referrals are based on some form of informal screening process or simply clinical judgment. Parents also may bypass the screening process altogether (self-referral) and seek guidance directly from early intervention professionals (see point of access). In other instances, a child and a family's circumstances (eg, prematurity/low birth weight; prior family history of abuse/neglect; sibling with autism) may dictate participation in a screening program or even result in a direct referral (based on risk indices[23]).

The value of parental concerns about their child's development and behavior should not be underestimated.[24] Parental concerns, especially when elicited in the primary care setting, using tools such as the Parents' Evaluations of Developmental Status,[25] can accurately identify even speech-language problems in young children.[26] Although parents may not be accurate in judging the specific forms of their child's problems, a meaningful and accurate awareness of difficulties nevertheless exists.[27] Parent concerns also can be effectively identified using questionnaires sent home at periodic intervals.[28]

The screening process, including selection of screening tools and determining criteria for identifying children for more in-depth evaluation (ie, refer due to concern or risk to point of access), is highly complex with considerable statistical uncertainty existing for many types of developmental problems. Moreover, the psychometric properties of various screening tools are far from adequate and require an acute sensitivity to cultural influences.[29] Although recommendations for screening have been put forward by professional organizations,[30] referral remains fundamentally a clinical decision requiring appropriate knowledge and skills.

What needs to be done

Community-based screening programs tend to be highly variable, often depending on the interest and leadership of specific disciplines (especially primary care physicians) as well as guidelines established by various governmental agencies. A more systematic process is clearly required and should begin by identifying existing community screening programs and high-risk registries as well as the tools that are used. Similarly, primary care physicians and other health care providers should be surveyed to obtain similar information, as evidence suggests that only a small percentage actually engage in any form of screening.[29] The broader concept of developmental surveillance in health settings involving multiple sources of information should be given serious consideration as well.[24]

Decisions will ultimately need to be made with respect to whether to build on an existing system or create something new. Issues of universal versus targeted screening, timing, risk criteria, and cost-effectiveness are only some of the matters that a community interested in systematizing its screening programs must consider. Clearly, primary care physicians and other health professionals will be central to any effort. Information campaigns to enhance the public's knowledge, particularly that

of parents and day care providers with respect to developmental milestones and causes for concern, should be undertaken as well.

Monitoring

Children who do not meet screening criteria for referral (ie, concern or risk) should enter into the monitoring phase of the system. This requires at least a consideration as to whether or not some form of surveillance should continue. Many children at risk, such as premature/low-birth-weight children, who pass initial screenings often enter into monitoring programs as problems may emerge as development unfolds (ie, high-risk infant follow-up[31]). In other instances, parent concerns, even if not confirmed by screening tests, may warrant continued monitoring. Parents are quite capable of noticing subtle developmental problems worthy of continued surveillance.[32]

The primary functions of monitoring are to minimize the possibility that a child has not been properly identified for further evaluation or to maintain contact with children who remain at risk for subsequent developmental problems, and to do so in a highly cost-effective and nonintrusive way. For children who do appear to warrant further monitoring, a specific monitoring program must be selected. The frequency of the surveillance and the tools to be used can now be more specific (eg, screens for autism spectrum disorders, hearing assessments, or evaluations of possible attachment disorders). As illustrated in Fig 3, if a concern or risk is identified at some future point, children would reenter the system via the point of access. If not, they would exit in accordance with the plan described in the monitoring program.

What needs to be done

Protocols for a monitoring program, often linked to specific risk categories of children, should be developed. The frequency of the monitoring should be based on best estimates of the likely emergence of problems. Of importance, exit criteria should be carefully established to ensure that no child leaves the system without a thoughtful review.

Point of access

Once a concern or risk has been identified, children and families enter a new phase of the developmental systems model. Families need to self-refer or be referred to a specific place to begin the process. Multiple points of entry are usually best, especially in larger communities, and are most easily accessed by families. Moreover, with multiple points of entry, parents are more likely to remain within their neighborhood or local community and the size of the organization being referred to is generally smaller, more manageable, and more personal. Certain organizations that serve as points of entry also can have special areas of expertise, particularly for children and families with potentially complex and/or low-incidence problems.

The primary tasks of this first point of access are threefold. The first is to gather together existing information and create a record for the child and family. The second is to divide children and families into biologic or environmental risk groups on the one hand (ie, those children not demonstrating delays or disabilities at this point and which may be able to be prevented from becoming manifest), and children with probable delays or disabilities on the other. Where both apply or uncertainty exists, the delay/disability path should be followed. The third task is to help organize a comprehensive interdisciplinary assessment for the child and family to evaluate a possible delay or disability or to refer a family to the appropriate preventive intervention program for children at risk due to biologic or environmental factors. Of importance, in many instances, circumstances may suggest that families move quickly to initiate an early intervention or preventive intervention program. The point of access can expedite this process.

What needs to be done

Points of entry need to be well known to community professionals and easily located through community-based and frequently updated directories. Record-keeping systems for the various points of entry should have common elements and

allow tracking via a centralized database. Moreover, each point of entry should be familiar with all others and have well-established connections with interdisciplinary assessment groups, including those specializing in certain disorders or disabilities, preventive intervention programs, and the general early intervention community. Often, a particular point of entry may serve multiple purposes, as is usually the case when the first contact (point of access) also is part of a multidisciplinary diagnostic clinic.

Comprehensive interdisciplinary assessment

One of the most costly and time-consuming, but vital, components of the developmental systems model is the comprehensive interdisciplinary assessment. Through this process, essential information for children with suspected or established developmental delays or disabilities is obtained that greatly facilitates subsequent plans and recommendations.[18] In particular, the interdisciplinary assessment team process will generate a profile of child health and development and describe patterns of family functioning within their home, neighborhood, and larger community. In addition, the team attempts to generate a diagnosis, often categorical in form (eg, cerebral palsy, developmental delay), but may have sufficient information to establish a biologic or environmental etiology or multiple etiologies. Although considerable uncertainty is common, families nevertheless benefit substantially from this information. Moreover, developmental profiles and diagnostic/etiologic information serve as a basis for organizing general recommendations for the family and establishing a need for information that may further clarify issues now and in the future.

The comprehensive interdisciplinary assessment often requires considerable time to arrange. Moreover, extensive preliminary information needs to be gathered beyond that obtained at the point of access in order to ensure a productive outcome. The selection of disciplines to be involved in the assessment is a critical decision as well, but again requires time to properly organize.[33]

But families cannot and should not wait to receive at least preliminary intervention services and supports until this comprehensive interdisciplinary assessment can occur. Consequently, as illustrated by the dotted line in Fig 3, families, as appropriate, should directly enter the early intervention program (automatically being considered eligible at this point) and receive a preliminary intervention program (see later discussion). Often considerable information is available from screening or monitoring programs to facilitate this process.

What needs to be done

Communities must ensure the availability of interdisciplinary assessment teams with clear relationships to points of access in the system. Most of these teams will be general in nature, having the capability of addressing a wide range of possible problems. It also might be advisable for communities, however, to establish a limited number of specialty interdisciplinary teams, focusing on specific disabilities such as autism spectrum disorders, abuse and neglect, or metabolic disorders such as phenylketonuria.[34] Information gathered at the point of access can determine whether a specialty interdisciplinary team is warranted. Specialists from these teams also can serve as a resource to the more general teams as needed.

Other less costly strategies may be considered as well in which a smaller interdisciplinary group functions together (eg, early childhood special educator, speech-language pathologist, and social worker), but gather information from other specialists independently (eg, geneticists, psychologists, occupational therapists). Although not ideal, strategies such as this may serve as a transition to the development of more comprehensive teams in communities as resources permit.

Early intervention program eligibility

By the time children reach this point in the system, most will meet eligibility criteria and formally enter the early intervention program. However, depending on the criteria established, the interdisciplinary assessment team may fail to find

evidence of delays or disabilities that meet criteria for eligibility for some children and families. Moreover, screening tools and clinical judgments are certainly not infallible. Yet, despite not meeting eligibility requirements, the concerns that brought the child to the team should be taken seriously, and children and families should remain within the system. As Fig 3 illustrates, two options exist. First, children and families would enter the monitoring program and some form of surveillance would be planned. Through this process, a better determination can be made as to whether concerns or risks will emerge over time. Second, the comprehensive interdisciplinary assessment, based both on the child's health and developmental profile and family functioning, may determine that sufficient biologic or environmental risks exist to warrant entry into the preventive intervention program (see Fig 3). Although the intensity of this preventive intervention may be low for children entering through this path, it nevertheless extends beyond surveillance to include activities that actively promote more optimal family patterns of interaction (see below).

What needs to be done

Communities need to establish eligibility criteria for entry into early intervention programs. Although expense is a concern, intervention approaches taken by the developmental systems model are strictly needs based. As such, as described later, services and supports are designed to be provided in the most economical and efficient manner possible, thereby encouraging more liberal eligibility criteria. For those children deemed not eligible to enter the early intervention program, communities also should establish criteria for selecting the monitoring and preventive intervention options.

Enter early intervention program

At this point, children and families enter into the formal process that ultimately will result in the provision of some combination of resource supports, social supports, and information and services. For this to occur, however, stressors that may be perturbing family interaction patterns must be assessed. As described earlier, the assessment of stressors is a central feature of the developmental systems model and is discussed in the next section.

Nevertheless, as illustrated in Fig 3, it is often advisable to enroll children almost immediately in early intervention and organize what can be considered to be a preliminary intervention program. Based on information gathered at the point of access, a preliminary intervention program, including identifying the "home base" for early intervention, can be readily established. If only limited developmental information is available for the child, some evaluations should be conducted using standard developmental tests and an abbreviated process to assess stressors carried out. A service coordinator also would be selected who would work most closely with the family and jointly develop the program. Special attention should be devoted to building a long-term partnership with families during this phase of the process. This also would be an ideal time to identify professionals who would participate in the assessment of stressors component and ultimately develop and implement the more thorough early intervention program.

What needs to be done

In some instances, the point of access and the main early intervention program contact for the family will be housed together. However, referrals to a variety of programs will occur depending on the needs of children and families. Consequently, communities must have a well-developed inventory of early intervention programs and options available. In addition, communities must have the capacity to place children in different programs quickly, develop a preliminary intervention program, choose a service coordinator, and begin to organize the assessment of stressors. An abbreviated form of the assessment of stressors also should be available.

Enter preventive intervention program

Children and families can enter the preventive intervention program by either of the two paths illustrated in Fig 3. As is the case for children

entering the early intervention component, a preliminary intervention program may be established almost immediately prior to the more formal assessment of stressors. By this point, the nature of the risk and specific risk factors are generally known so that a meaningful program can be organized. An abbreviated version of the assessment of stressors would be of value here as well. This preliminary program also can provide the context for building a strong relationship between the service coordinator and the family. Especially for children at risk due to environmental factors, these relationships are the key to success.[35]

What needs to be done

Preventive intervention programs for children at risk are proactive, varying in intensity and complexity in a manner similar to that of early intervention programs for children with established disabilities. Despite this fact, community options for preventive interventions are unusually diffuse and difficult to identify. A plan for formal identification of preventive type programs must be undertaken. A major challenge for communities, then, is to identify relevant services ranging from short-term counseling options to intervention-oriented day care. Connections to programs for early intervention should be considered, and more overlap is likely to be advantageous for all concerned. Ultimately, decisions must be made with respect to the level of integration of preventive and early intervention programs.

Assessment of stressors

The assessment of stressors is designed to acquire information that will help ensure optimal family patterns of interaction. As noted in Fig 3, paths from both early intervention and preventive intervention programs go to the assessment of stressors component. For children with established disabilities or those at significant biologic risk, possible stressors related to the four categories described earlier must be assessed: (1) information needs, (2) interpersonal and family distress, (3) resource needs, and (4) confidence threats.

This is one of the most critical and perhaps the most complex component of the developmental systems model, as information now is gathered through some combination of interviews and discussions as well as through questionnaires or scales independently completed by the family. The interview process is essential in building partnerships with families and should be entered into in that spirit. Needs are best addressed through a combination of open-ended and highly specific questions. For example, exploring what the family's perceptions are about their child's development is a valuable first step. Issues of what services would be appropriate might then follow. A useful protocol is the Family Needs Survey,[36] which could form the basis for an initial discussion of broad topic areas. However, the assessment of stressors must go beyond the more general identification of topics and proceed to focus on more specific areas of strength and concern. Information from surveys and questionnaires that parents may have completed earlier addressing domains such as parent- and child-related stress,[37] family adaptability and cohesion,[38] or social support[39] can indicate points to focus on.

The developmental approach to early intervention illustrated in Figs 1 and 2 provides a way of thinking about the assessment of stressors. The necessity of a particular framework is underscored by the fact that the assessment process for stressors is fluid by its very nature and can easily lose its focus. The question to always keep in mind when assessing stressors is: "What information is needed to help maximize family patterns of interaction?" It is important to remember that each of the four categories of stressors can affect one or more of the three family patterns of interaction. Once stressors are evaluated that might be affecting family patterns of interaction, both parents and professionals will be in a position to agree jointly on the most effective preventive or early intervention program. Agreement on stressors affecting families is a major accomplishment and, if done thoughtfully and sensitively, will establish a pattern of partnership and collaboration that will benefit all concerned.

To determine information needs, interview questions should be organized to identify likely issues consistent with the child's developmental level that could function as stressors for each of the three family patterns of interaction. For example, questions regarding possible information stressors for parent-child transactions might address whether parents feel that they have to be more directive than they would like when interacting with their child (unbalanced turns). Related questions about parents' ability to know what their child means (reading of cues) can, combined with other information, serve as a basis for developing it as a priority for intervention. These probe-type questions can be asked in a manner that does not alarm parents or sensitize them to problems that do not exist. It may, however, encourage parents to reflect on an important developmental process, one that can be easily disrupted (ie, serve as a stressor) as a consequence of their child's special needs. Probes regarding parent-child transaction domains of attachment, reciprocity, the affective nature of social exchange, or the quality of parent-child discourse can help orient families to these processes. Again, considerable care must be taken to acknowledge cultural influences on family patterns of interaction. Accordingly, the interview (or, more typically, interviews) can be used as a way of providing information to parents with respect to issues they may simply not be sensitive to. Of note, questions such as these should always be accompanied by explanations of why this developmental process matters, ask about and underscore the strengths their child brings to this developmental process, and suggest possible reasons why difficulties may exist. Information needs are paramount for families,[40] involving issues of child health, development, behavior patterns, immediate and long-term expectations, and the nature and characteristics of the child's early intervention program, among others. This assessment is, of course, an ongoing process, as more information requirements will emerge as the child develops.

On occasion, this process may result in a decision by all involved to gather further information via observations of parent-child transactions. Special care must be taken if this does occur to avoid any sense of being judgmental or evaluating "parenting skills." Not only is this inconsistent with developing a partnership with families, but also few reliable and valid assessment tools in the parent-child interaction domain are available.[41] The judicious use of certain instruments to provide a context for discussion regarding key developmentally anchored parent-child processes can be helpful, however.[42,43]

Similarly, information about possible child-focused services requires an informative set of discussions, including a possible need for additional information (eg, results from comprehensive interdisciplinary assessment). As in the example of parent-child interactions, the service coordinator must not only display outstanding listening skills but also be extremely knowledgeable about service options, the likely impact of these services on child development, and the involvement required of parents and other family members. A working knowledge of evidence-based approaches is essential.

As discussed, the other stressors in the developmental framework (interpersonal and family distress, resources, confidence) also may undermine parent-child transactions as well as the other family interaction patterns. Identifying stressors related to interpersonal and family distress, in particular, must be conducted with extraordinary sensitivity. Areas to explore include the nature of accommodations required that may be disruptive to family functioning, the potential for increased social isolation, issues of social support, and possible different perspectives held by mothers and fathers, among others.

Finally, family characteristics also constitute potential stressors and need to be carefully and sensitively assessed (see Fig 3). In many ways, family characteristics frame the entire process—we gain access to family strengths but also become aware of constraints that can have widespread effects on family patterns of interaction. Family financial resources, possible stressors in the marital relationship, the availability and helpfulness of

social supports, parental mental health, and beliefs and attitudes regarding child rearing should be explored, but only if it is relevant to family interaction patterns and only with family consent. The voluntary nature of the assessment of family characteristics should be emphasized.

For children with an established disability or those who are at significant biologic risk, it is often difficult to assess family characteristics independent of the child's influence on these characteristics. The intent here is to obtain a sense of the general status of family characteristics. Nevertheless, assuming that the child has been identified early, most influences are not yet likely to be substantial. In instances where the child's problems have existed for some time before entering the early intervention system, questions should be phrased to evaluate family characteristics that existed prior to the child's birth or simply integrated with the four categories of potential stressors related to child disability or biologic risk.

The absence of stressors related to family characteristics in many ways constitutes a potential strength and may well figure in the overall plan. However, it is the combination of information, representing both family strengths and stressors, that provides the basis for the development and implementation of the comprehensive intervention program for both children at risk (preventive intervention) and those with established disabilities (early intervention).

What needs to be done

A set of protocols, surveys, and questionnaires that can identify possible stressors affecting the three family patterns of interaction must be developed and agreed on. For example, a set of developmentally arranged interview questions designed to tap essential developmental processes must be developed that contribute information as well as elicit information. Questions must be organized within a developmental perspective and guided by previous information. Anticipatory guidance can be more effective when detailed information about the basis or bases of a child's risk or disability is available. The idea is to both continue to build a relationship with the family and to gather a wide range of information that will assist all involved to establish priorities and plan interventions.

The assessment of stressors associated with family characteristics must be carried out with great care and sensitivity. This is particularly the case where the risk to the child stems primarily from environmental factors. Minimum qualifications, both in terms of training and experience, must be established before entering into discussions that cannot possibly be productive without qualified personnel. Where issues of abuse or neglect, illegal drug use, or other special considerations arise, separate protocols must be developed.

Develop and implement comprehensive program

Once a list of agreed-on needs has been generated through the assessment of stressors, an intervention program is developed to address those needs. Whether in the form of a preventive or an early intervention program, the process requires identifying appropriate resource supports, social supports, and information and services to address stressors. At this stage, concrete suggestions for activities are discussed and justified, and a coordinated intervention program that blends these elements is put together. Interventions might include recommendations for family counseling, participation in parent groups, or perhaps suggestions for recreational activities in the community to help build a child's peer social network. It is this phase of the developmental systems model that challenges interventionists to truly form a collaborative relationship with families and to jointly agree on the specifics of the comprehensive program. For child-focused services, a frank discussion of program content, intensity, roles of all participants, and expectations for outcomes should be part of the process and captured in a formal, family-friendly document. It is here that a fair presentation of intervention practices supported by evidence is crucial in arriving at a reasonable decision. A holistic picture needs to be developed, considering

the array of ecologic influences on children and families.

Constraints on families must be recognized and strengths capitalized on, as this is critical for proper program implementation. Timing, intensity, efficiency, coordination, and parental roles are among the implementation issues that must be considered.

What needs to be done

A process and set of decision rules appropriate for both families and interventionists should be developed to guide the development of a comprehensive plan. Correspondingly, possible resource supports, social supports, and information and services should be identified that can address the needs (stressors) agreed on earlier. This "matching process" constitutes the formal structure designed to maximize the three family patterns of interaction. Intervention will take numerous forms and might include family-friendly information packets with respect to a variety of disabilities and risk conditions as well as listings of community programs, specialists and their expertise, and parent groups, among others. Both short-term and longer-term plans should be developed, with the responsibilities of all involved clearly identified. Communities also need to organize or gain access to the most current information and evidence available to justify practices, and many guidelines are now becoming available.[10] Parents should be encouraged to review this information as well. It is the case that some parents may prefer that a comprehensive program plan be proposed by the service coordinator with accompanying rationales. But even in this instance, a collaborative relationship must be encouraged. Explanations, providing options, and seeking concurrence are all means of involving families. Together, a clear individualized plan with appropriate expectations can be developed and implementation begun.

Monitoring and outcome evaluation

No system can be effective without a sound monitoring program and evaluation plan. A clear structure for programs and expectations for outcomes are essential for success.[44] Even under ideal conditions of assessment, individualized program development, and intervention, it is uncertain whether the goals, objectives, and means to ends are appropriate and will have the desired effects. All involved need to know how children and families are progressing, and plans must be adjusted accordingly. Similarly, stressors may change periodically as a consequence of major life events, changes in children's developmental patterns, or when children or families face transitions. A monitoring system related to stressors should therefore be in place as well. Correspondingly, for children at risk participating in a preventive intervention program, consideration should be given to the need for a comprehensive interdisciplinary assessment should the child's developmental patterns warrant that action. If, on occasion, when marked or unexpected changes in behavior or development are apparent, a comprehensive interdisciplinary reassessment may be indicated.

What needs to be done

Monitoring and evaluation systems often are cumbersome and unnecessarily complex. To be effective, communities must develop streamlined systems capable of capturing core information across all children and families, while allowing sufficient flexibility to adjust to individual children and families. The existence of a common assessment and intervention program development process will certainly simplify that task. Core information should be transmitted to a central database with all appropriate protections for confidentiality and be available to individual professionals and families. Web-based technologies can easily support the development of a common database and can control access appropriately. Other strategies will be required to evaluate specific aspects of the system including measures of parent and professional satisfaction, efficiency of the system, and whether specified child outcomes have occurred. In these instances, sampling procedures involving independent evaluations are usually necessary.

Transition planning

Transitions occur at many points including from hospital to home, from infant/toddler program to preschool, and from preschool to kindergarten.[45] For children with special needs, transitions can easily disrupt well-established routines and cause considerable turmoil. Parents, too, experience stress during transitions, often inducing renewed anxiety regarding the ability of all involved to adjust satisfactorily to new patterns and expectations.[46,47]

What needs to be done

To minimize disruptions and maximize meaningful transitions, a planning process must be in place. Visits to the new environment will allay many fears. Moreover, communication with staff in the new environment about a child's special needs and interests may result in accommodations to improve the chances of a successful transition.

Transition plans for various environments should be established by communities. In fact, transition activities should be incorporated into the comprehensive program component. A number of successful models are available that can be adapted to the unique circumstances of each community.[45,48]

CONCLUSIONS

The developmental systems model has been guided by principles and practices that reflect contemporary developmental thinking and are consistent with existing empirical information. It embodies three core principles of which acceptance of a developmental framework as relevant to all children is most central. As a consequence, early intervention is best conceptualized as a system designed to support family patterns of interaction that best promote children's development. Organizing a model of early intervention in which the focus is on parent-child transactions, family-orchestrated child experiences, and helping parents to maximize their child's health and safety firmly orients early intervention activities toward strengthening families. The other two guiding core principles for the model—integration and inclusion—are intended to maximize collaboration and coordination at all levels of the system and to encourage full participation of children and families in all aspects of community life. All three core principles should be represented in every component of the model.

Additional principles are also embedded in the design of the model. These include the importance of early detection and identification of developmental problems, the value of developmental surveillance and monitoring, the necessity to individualize all components of the system for children and families, the understanding that success is not possible without a strong evaluation process, a recognition that a meaningful partnership with families cannot occur without sensitivity to cultural differences and their developmental implications, a belief that recommendations and practices must be evidence based, and that a systems perspective must exist to ensure that all components of the model and their interrelationships are properly considered.

Despite its formal nature, the developmental systems model was created to be flexible and open to change at all points and to accommodate new information or shifting priorities. For example, new information from clinical trials on the effectiveness of specific interventions for a well-defined subgroup of children or information that certain strategies are more effective than those currently in use in yielding longer-term outcomes would be considered when developing the comprehensive intervention component of the model. Similarly, priorities might be altered if evidence continues to mount suggesting that more emphasis should be given to matters of children's social competence[49] or to socioemotional development[2] in the design of early intervention programs.

The fact that this system, or any system for that matter, must be open and dynamic to maintain its effectiveness underscores the point that, at each component, mechanisms must be available to ensure that current information can be incorpo-

rated. Consequently, training of staff, continuing searches for and cataloging of new and relevant information, and opportunities for systems review must be in place.

The model presented here, then, provides a framework for organizational design and decision making. Despite its structure, it is apparent that everyday interactions with children and families in early interventions are highly personal and even idiosyncratic experiences. Protocols notwithstanding, interviews, assessments of stressors, intervention plans, and intervention activities will take many diverse forms dictated by the individual characteristics of those involved and by prevailing circumstances. However, the framework provided by the model will hopefully result in a shared vision of early intervention and a shared way of thinking about the issues. If this level of consistency can be achieved, it can be said that a meaningful system is in place.

Finally, the developmental systems model for early intervention requires an unprecedented level of commitment and cooperation by all those involved: state and community agencies, professional groups and practitioners, parents, advocacy organizations, researchers, and institutions of higher education. The approach presented in this article can only provide the framework for such a collaborative effort. If the will to establish such a model exists, however, there is every reason to believe that the development and well-being of vulnerable children and their families will be substantially improved.

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