

An Interprofessional Collaborative Approach in the Development of a Caries Risk Assessment mobile tablet application: My Smile Buddy

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Abstract: **BACKGROUND:** Given the rising trend in Early Childhood Caries (ECC) and the wide disparities that exist in pediatric oral health, risk assessment for ECC has become increasingly important. The purpose of this paper is to describe lessons learned from an Interprofessional Collaboration (IPC) approach in the planning, development, and pilot testing of an electronic interactive ECC risk assessment application - My Smile Buddy (MSB). **METHODS:** Five focus groups were conducted during the assessment and development phases of MSB. Community Health Workers (CHW) then facilitated MSB with 35 mothers from the local community. **RESULTS:** MSB was well accepted by mothers and scored well in usability and usefulness by CHWs. Lessons learned during MSB development included recognizing CHW understanding of local community attitudes regarding oral health and access to dental care and that power-sharing is required in order to create an intervention that is both engaging and accepted by the community.

Early childhood caries (ECC) remains the most prevalent chronic disease of early childhood, five times more common than asthma.¹ Despite dental caries being readily preventable, oral health surveillance data reports that almost a third (28%) of all U.S. preschoolers experience dental caries,² increasing from 11% among two-year olds to 44% among five-year olds.³ Early childhood caries is costly and consequential, accounting for millions of lost child school hours and parent work productivity, high rates of recurrence even after complete surgical repair,⁴ unnecessary pain and suffering, and even death.⁵ Wide disparities in ECC exist across pediatric populations by income and ethnicity with caries prevalence, extent, and severity all more extreme in children

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of minority and low-income families. These are the same populations who encounter the largest barriers to accessing pediatric dental services.^{2,6,7}

Risk assessment has become increasingly important as ECC has become recognized as a chronic disease process which can be medically managed with early identification. Conceptual models have expanded on traditional ECC risk factors to include family, community, and societal level determinants as well as psychosocial measures of self-efficacy.^{8,9} Current ECC risk assessment, however, remains primarily designed by and created for dental professionals in office settings and focused on individual indicators of clinical disease such as past caries experience. The few non-clinical indicators include only general measures of dietary habits and parental health literacy or the population level risk measure of family socioeconomic status.^{10,11} The paucity of socio-behavioral indicators for individual risk assessment results in a profound lack of specificity and practical utility. Novel approaches to risk assessment using interprofessional collaboration (IPC) may allow for improved early identification of high risk individuals and utilization of the non-dental workforce who are readily available within these vulnerable and underserved pediatric populations.

Interprofessional collaboration is the process of communication and decision-making by two or more professionals that enables the separate and shared knowledge and skills of health care providers to synergistically influence patient care.¹² It has been used in the prevention and medical management of other chronic diseases for high risk and underserved child and adolescent populations, shown promise to improve health care and patient outcomes,¹³ and is believed to enable professionals to achieve cost effective and patient-focused community care.¹³⁻¹⁵ Interprofessional collaboration was first introduced at the Institute of Medicine Interrelationships of Educational Programs for Health Professionals Conference in 1972 and included representatives from allied health, dentistry, medicine, nursing, and pharmacy.¹⁷ In the 1980s and 90s, the concept of the interdisciplinary team arose in community clinics and other public health practice settings. Today, IPC is an accepted health care approach in training and direct patient care services and grounded in theoretical frameworks driven by organizational theory or organizational sociology. The purpose of this paper is to share initial findings and lessons learned from an IPC approach in the planning, development, and pilot testing of *My Smile Buddy* (MSB), an electronic interactive ECC risk assessment application.

Methods

My Smile Buddy was the result of a collaborative effort conceived at Columbia University through a one-year Clinical and Translational Science Award planning grant¹⁸ and was continued through a subsequent National Center on Minority Health and Health Disparities Challenge Grant.¹⁹ The project included partnerships between seven Columbia University Schools and Centers: the Colleges of Physicians and Surgeons and Dental Medicine; the Schools of Social Work, Nursing, and Public Health; the Behavioral Nutrition Program at Teacher's College; and the Center for New Media Teaching and Learning. The primary problem addressed by MSB is the existing gap between the instruction provided to families of young children with chronic diseases and the capacity of families to act on that instruction.

My Smile Buddy is designed for use on a portable interactive multimedia device (Apple i-Pad) that assists the community health worker (CHW) or other peer educators without previous dental training to engage poor, minority, low-literacy parents of young children in order 1) to assess a child's risk for ECC, 2) to educate on issues related to pediatric oral health, and 3) to set individualized goals for their specific needs and concerns. My Smile Buddy risk assessment included measures used by the American Academy of Pediatric Dentistry and the American Dental Association as well as additional measures of social support, parental confidence, and a 24-hour recall of dietary and fluoride exposures.

“What would ECC risk assessment look like if it were designed, not by dentists, but by social workers, nurses, physicians, nutritional behaviorists, public health, information technology, and community experts?” This was the question that drove the planning and development of MSB. In addition to quarterly collaborative meetings and smaller workgroup meetings, five focus groups were conducted during the assessment and development phases of MSB over a period of 20 months (Figure 1). Focus groups utilized convenience sampling and all participants were representatives of the local community of Northern Manhattan. Two sessions were performed with CHWs of a community organization serving local expecting mothers and mothers with young children. Two sessions were performed with families and staff from local Head Start and Early Head Start programs. One session was performed with the dental staff and pediatric dental provider trainees of a local safety net pediatric dental clinic.

My Smile Buddy was then pilot tested with CHWs (n=4) from the Northern Manhattan Perinatal Partnership, a case management program that provides health and family support to pregnant women and parents of young children. Community health workers first participated in two two-hour training sessions. Session one included an overview of ECC and a demonstration of the MSB program. Community health workers were then provided with an instructional guide and i-Pads and encouraged to gain familiarity with the MSB application. A second training session was convened two weeks later to discuss their experience and to role-play with trainers.

Following this training, CHWs facilitated MSB with a convenient sample of Latina mothers of client families from the local community (n=35) and were incorporated into their normal family visit schedule. The evaluative phase of MSB began within one month after last MSB session was completed. Community health workers were asked to complete an anonymous questionnaire that included five-point Likert scale and open-field questions on the usability and usefulness of the program. Additional qualitative data was also collected from a single one-hour focus group of mothers who participated in MSB (n=4) using a bilingual facilitator and a semi-structured question guide. This study was approved the Columbia University Medical Center Institutional Review Board (#AAAE5799).

Results

On average, mothers (n=35) completed 94.5% of MSB materials and 94.3% of ECC risk assessment questions within their one hour session with CHWs. All mothers

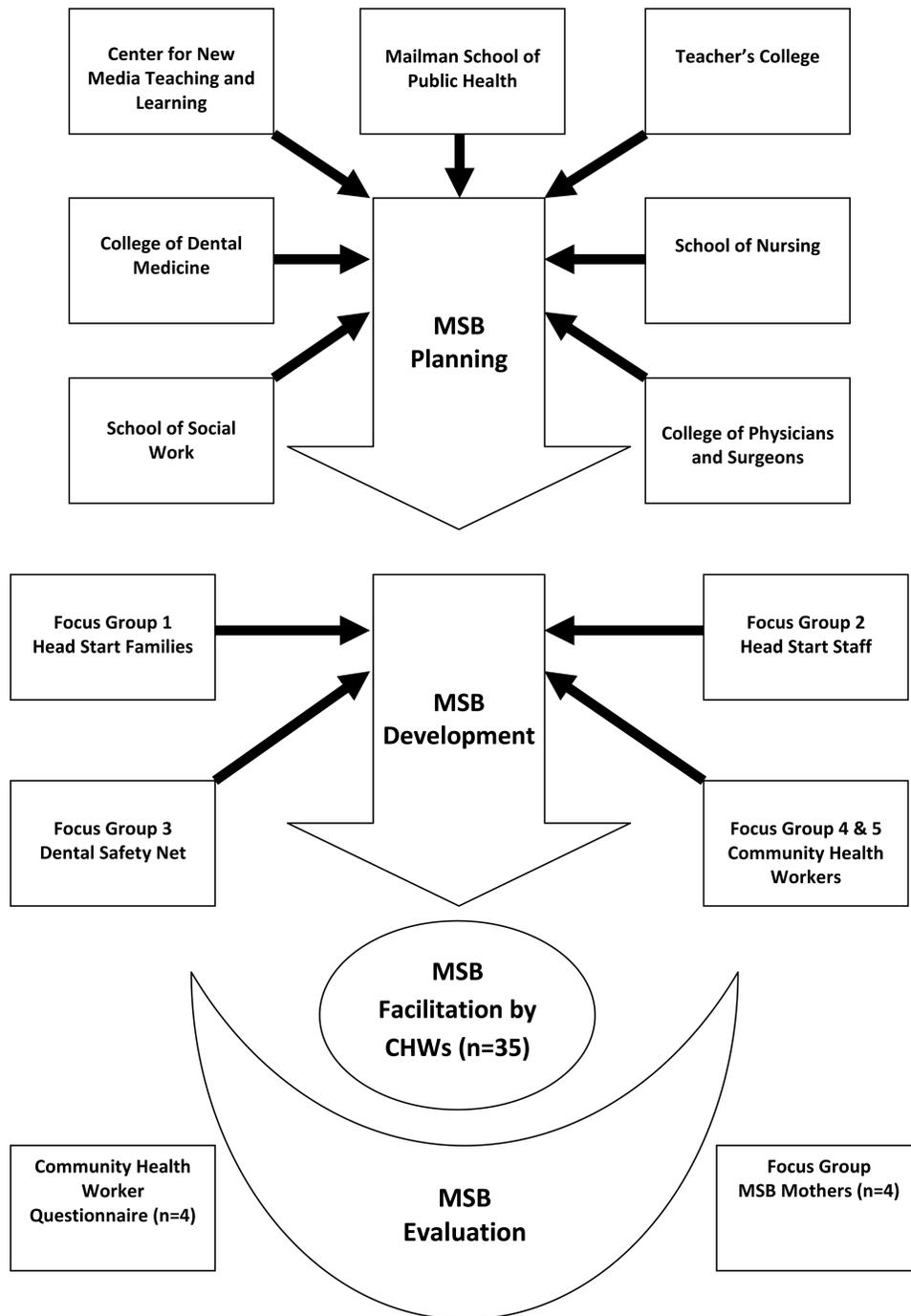


Figure 1: Overview of MySmileBuddy Project

reported receiving WIC and 74.3% (26/35) had a child that was three years old or younger. Regarding oral health status, 57.1% (20/35) of mothers had taken their child to the dentist within the last 12 months with 17.1% (6/35) having at least one cavity (Table 1). Fifty percent (14/28) of mothers reported that they do not brush their child's teeth on a daily basis and 54.3% (19/35) of mothers reported that most of the mothers they know brush their children's teeth every day.

Focus group mothers (n=4), in general, felt comfortable talking about oral health with their CHW. One mother felt happy to “*know how to brush [her] child's teeth properly*”. Mothers said that they enjoyed learning from the i-Pad. The device was something “*new and cool*” and was “*faster and easier to learn from*.” Another appreciated that MSB was available in Spanish and felt that her CHW “*knew the information well*.”

Regarding MSB risk assessment, one mother was surprised and had never considered if her child's toothpaste had fluoride or not. Most mothers found the 24-hour dietary recall easy to complete and all mothers agreed that seeing pictures were helpful in recalling what their children ate for the day. All mothers also responded that they felt comfortable answering honestly.

Only two of the four mothers successfully recalled the educational videos themes. However, one mother especially remembered the cartoon portion and the “*house on fire*” analogy used to describe the caries process. “*It was understandable and helpful*”. Another mother stated that she had just been to a dental visit so most of the materials were a review. Most interestingly, one mother said that she had also heard many of the lessons on oral health from her dentist, but believed it more coming from her CHW. She attributed this to the CHW being able to communicate in Spanish and the level of trust she feels with the CHW. All mothers were able to correctly recall their specific oral health goal and three-out-of-four mothers reported success in achieving their goal.

Community health worker-completed questionnaires revealed an average score of 1.75 (1.00=very easy, 5.00=not easy at all) in program navigation and in overall use of MSB (Figure 2). In regard to the usefulness (1.00=very useful, 5.00=not useful at all), CHWs reported an overall average score of 1.25 with 1.75 in risk assessment, 1.25 in family education, and 2.00 in goal setting (Figure 3). Lowest CHW reported scores were found to be in ease of completing the diet assessment (2.50), ease in uploading family information (2.25), and ease in finishing within the allotted time (2.25).

Community health workers found the overall MSB application “*easy to understand*” and “*very helpful*.” Community health workers also reported that the most challenging aspects of MSB were creating “*a state of confidence*” between families and “*the use of technology*” and operating the application while simultaneously engaging the client. Community health workers found the educational videos, informational sheets, and the novelty of the i-Pad to be the most beneficial characteristics. Interestingly, CHWs reported that while their clients initially “*felt skeptical about the technology*” or “*expected to be judged by the way they take care of their families*,” they soon became “*happy*” and “*thankful*” and believed that MSB helped their families to understand pediatric oral health “*in a visual way*.”

Table 1.**MYSMILEBUDDY PARENT EARLY CHILDHOOD CARIES RISK ASSESSMENT RESPONSES (N=35)**

Child cavity in the last 12 months (n=35)		
	N	%
Yes	6	17.1
No	23	65.7
Don't Know	6	17.1
Child routine dental checkup in the last 12 months (n=35)		
	N	%
Yes	15	42.9
No	20	57.1
Paste type (n=26)		
	N	%
Adult Fluoride	4	15.4
Child Fluoride	13	50.0
Non Fluoride	9	34.6
Child tooth brushing (n=28)		
	N	%
None	14	50.0
Once	3	10.7
Twice or More	11	39.3
How often to bed with a bottle or sippy cup with caloric beverage? (n=35)		
	N	%
Always	5	14.3
Often	2	5.7
Sometimes	4	11.4
Never	24	68.6
Number of risky dietary exposures (n=35)		
	N	%
None	21	60.0
1 to 2	13	37.1
3 to 4	1	2.9

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Table 1. (continued)

Who brushes (n=33)		
	N	%
Both	11	33.3
Child	1	3.0
Parent	21	63.6
Parental toothache in last 12 months (n=34)		
	N	%
Yes	8	23.5
No	26	76.5
I am confident that I can reduce the chances of my child getting tooth decay (n=35)		
	N	%
Agree	23	65.7
Disagree	4	11.4
Not Sure	8	22.9
It is often difficult to cut back on the number of sweets my child eats because they get upset (n=34)		
	N	%
Agree	12	35.3
Disagree	15	44.1
Not Sure	7	20.6
In general, how much of a problem have you or your other children had with tooth decay? (n=33)		
	N	%
A Lot	3	9.1
Some	10	30.3
Few	11	33.3
None	9	27.3

Discussion

Two valuable lessons were learned from taking an IPC approach in the planning and development of MSB. The first was in recognizing the ability of CHWs to accurately sense how the local community viewed oral health, ECC, and access to dental care. Community health workers expressed that many families are culture-bound to express deference to health professionals. This coupled with language barriers may explain why professional directives are challenging to implement at home and the current discon-

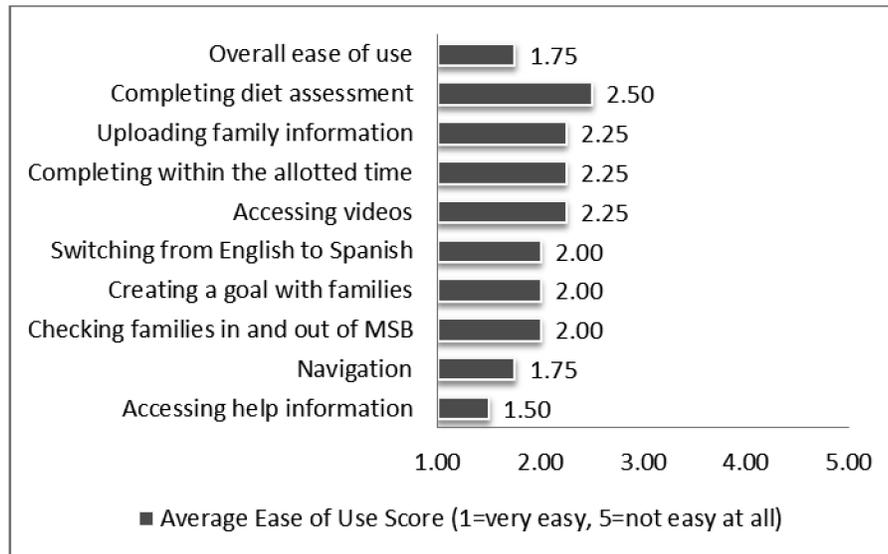


Figure 2. Average reported ease of use score of MSB by community health workers (n=4) by category.

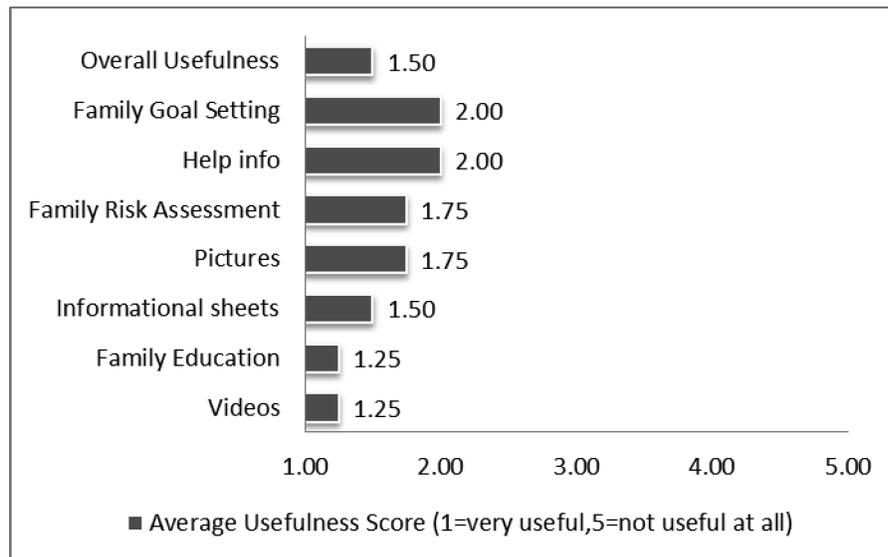


Figure 3. Average reported usefulness score of MSB program by community health worker (n=4) by category.

nect between parents and health providers. In contrast, CHWs distinguished their approach as first “*identifying the issues and culture*,” determining “*parental education and understanding* [of the condition to be addressed],” and “*dealing with the immediate issue*” before working with a family to implement a professionally recommended care plan. Community health workers also noted that they strive to be non-judgmental,

conversational, to “*meet families where they are*,” to establish a “*trusting relationship*,” and to be “*someone in [the family’s] corner*.” This dynamic was confirmed in our qualitative pilot data with parents stating that they preferred a CHW over a dentist—due to a common spoken language and a level of trust that is not present with the dentist.

Despite acknowledging having issues with their gums and teeth, many parents did not consider ECC to be a problem because they had been successful in connecting with pediatric dental services and expected that all prevention, oral health promotion, management, and repair would fall under the domain of the dentist. When queried for their opinions on the importance of oral health to the families they served, CHWs responded that their families were concerned about many issues but that the top-ranked were food, job, and housing insecurity. This experience was a valuable lesson in understanding community capacity and family choices which informed on the appropriate framing of MSB in the local community as well as potential partners such as WIC programs, Head Start, and local housing authorities.

A second lesson learned was in sharing power and decision-making. It was important to ensure that the MSB intervention did not ultimately come from the device itself but through the skills of the facilitator. Community health workers seek to empower families by assisting them not in “*what to do*” but by engaging them to “*choose to do*” with the goal of establishing the conditions and opportunities for parents to make healthier choices. This free flowing style of conversation is ideal for obtaining accurate data and in incorporating elements of health information and goal setting but also inherently problematic in collecting complete objective baseline data. Balancing between risk assessment validity and user-client acceptability was challenging.

Finally, it was decided to include only 11 of the original 26 variables into the final pilot risk model in order to have the time and flexibility required for the conversational style used by CHWs. In return, we also ensured that CHWs would complete the risk assessment prior to engaging in any health education or goal setting. This example of compromise and power-sharing not only allowed CHWs to assume greater ownership and personal connection to the project but also resulted in an application that blends well with existing CHW-parent interaction and ensures health information is communicated in an engaging and acceptable way. We were pleased to observe how CHW use of MSB quickly evolved from presenting materials to having engaged conversations, sometimes with i-Pad sitting unused in their laps.

While our pilot test sample is small, we believe the approach was validated by the positive response of CHW and parent subjects in both the acceptance and usability of MSB. Additional quantitative data collection that includes individual child dental exam findings to validate the MSB risk algorithm is currently ongoing and it is envisioned that the final MSB application will have strong utility in both dental and non-dental community settings such as Head Start and WIC centers.

With public-funded insurance now providing health coverage for a third of U.S. children,^{20,21} it is inadequate to rely solely on measures of socioeconomic status or home care behaviors to identify children at high risk for ECC. Further, it is estimated that Americans spend \$109 billion on dental services each year. One-third of these expenses are attributed to child dental services with a substantial portion, nearly 65% or \$23 billion, spent on preventative and diagnostic procedures alone.²⁰ Solutions for

ECC may not lie in only increasing public dollars in oral health prevention, but in also ensuring that current dollars are being directed towards refining current risk assessments that can accurately and reliably identify those at highest risk for disease and ensure optimal oral health for all children.

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