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# Enhancing State Medical Home Capacity through a Care Coordination Technical Assistance Model

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**Abstract** *Introduction* A practice-based care coordination (CC) model was developed by Louisiana's Title V Children's Special Health Services (CSHS) program to meet the overwhelming needs of the New Orleans post-Katrina population. The pilot clinic demonstrated an improvement in medical home (MH) capacity over the course of 3 months. The purpose of the current study is to evaluate the replicability of the model and sustainability of MH improvement over at least 2 years, while identifying factors that may modify the effect of the intervention. *Methods* The CSHS CC model utilizing a practice based care coordinator was implemented in 15 academic primary care pediatric clinics. Increase in MH capacity was determined using the MH Index-Short Version (MHI-SV) tool. *Results* The analysis of the MHI-SV scores for the ten clinics with >2 years of data demonstrated a significant improvement with each of the ten MHI-SV indicators. The mean clinic MHI-SV score improved from 19.70 to 34.15 on a scale of 10–50. Characteristics associated with the greatest MHI score improvement were rural geographic location, having an electronic health record, and using social workers or nurses as care coordinators. Characteristics associated with lower MHI scores were physician or care coordinator turnover and using stand-alone databases rather than tracking CC activities within the central patient record. *Conclusion* This study provides a flexible framework for implementing CC services in pediatric, family medicine, and medicine-pediatric practices, and demonstrates the value of CC as a driver for improvement in medical home capacity.

**Keywords** Patient-centered care · Medical home · Care coordination · Patient-focused care · Primary health care

**Abbreviations**

| | |
|---|---|
| CYSHCN | Children and youth with special health care needs |
| MCHB | Maternal and Child Health Bureau |
| CC | Care coordination |
| CSHS | Children's Special Health Services |
| PCMH | Patient-centered medical home |
| NICHQ | National Initiative for Child Health Quality |
| MHI-SV | Medical Home Index-Short Version |
| CAHMI | Child and Adolescent Health Measurement Initiative |
| LSUHSC | Louisiana State University Health Sciences Center |
| MCO | Managed care organization |
| QI | Quality improvement |

## Significance

*What is known on this subject?* Practice-based care coordination (CC) is more effective than agency based CC for CYSHCN, however, replicable models for integrating CC into a busy primary care practice are lacking. *What this study adds?* This study describes a technical assistance model for implementing CC into the medical home which improve all aspects of medical home capacity, as measured

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by the Medical Home Index-Short Version, and describes clinic characteristics associated with MHI improvement.

## Introduction

Pediatric care coordination (CC), is defined by the 2014 AAP policy on CC, as a “patient- and family-centered, assessment-driven, team-based activity designed to meet the needs of children and youth while enhancing the care giving capabilities of families”. Care coordination addresses interrelated medical, social, developmental, behavioral, educational, and financial needs to achieve optimal health and wellness outcomes (Council on Children with Disabilities and Medical Home Implementation Project Advisory Committee 2014). CC can be agency based or practice based. All states receive funds for CC from the Maternal Child Health Bureau (MCHB) through their Title V Block Grant, and in most states (59%) (Aydede and Shenkman 2007) these funds are used to provide agency-based CC. Agency-based CC is usually provided by a nurse who is not in the medical home (MH) and frequently accessible only by phone. In a minority of states the Title V program offers practice-based CC. Practice based CC is a core element of the Patient Centered MH (Council on Children with Disabilities and Medical Home Implementation Project Advisory Committee 2014; McAllister et al. 2007), and has been shown to result in greater family satisfaction with office staff and fewer barriers to needed services (Cooley et al. 2003; Berry et al. 2011). Care coordinators work with the healthcare team and the family to manage care transitions, community and therapy referrals, prior authorizations, and equipment and pharmaceutical requests. Both nurses and social workers have been found to be effective care coordinators (Hawk et al. 2015; Monterio et al. 2016; Biernacki et al. 2015; Richardson et al. 2015). CC improves patient outcomes and increases clinic productivity by transferring non-clinical duties from the physician to CC staff (Council on Children with Disabilities and Medical Home Implementation Project Advisory Committee 2014).

This study describes a replicable practice-based model for CC that was implemented by the Louisiana Title V Children and Youth with Special Health Care Needs (CYSHCN) Program, Children’s Special Health Services (CSHS). The CSHS CC model was adapted from the 2003 National Initiative for Child Health Quality (NICHQ) MH Learning Collaborative (National Initiative for Children’s Health Quality 2003) and modified to improve efficiency while meeting overwhelming needs of the New Orleans post-Hurricane Katrina population in 2005/2006. The initial study, published in 2011 (Berry et al. 2011), demonstrated improvement in MH capacity as measured by the MH Index (MHI) and family satisfaction as measured by the MH Family Index, at a cost of $36.88 per CYSHCN per year. Encouraged by this success, CSHS proceeded to implement the intervention in academic practices across Louisiana.

While extensive research has focused on incentives for improving MH capacity, few articles describe CC as the driver for MH transformation. This article describes a CC model as a driver for improvement in MH capacity, and examines the effect of various clinic characteristics on the model’s success.

## Methods

### MH Capacity Measurement

This study examined the impact of the CSHS CC model on MH capacity as defined by the MH Index (MHI) (Cooley et al. 2003). The MHI is endorsed by the Center for MH Improvement to quantify “medical home-ness” and was used to determine baseline and follow up MH capacity among clinics. The original 25 item MHI proved burdensome for providers, and was replaced with the MHI-Short Version (MHI-SV) after the first three clinics were enrolled. The MHI-SV records information on 10 of the original 25 MHI items, permitting original MHI scores to be recoded as MHI-SV scores. Each of the ten indicators (Fig. 1) was rated on a continuum of care across three levels: Level 1 is responsive pediatric care, Level 2 is pro-active care,

| Medical Home Index- Short Version Indicators |
|---|
| Family feedback |
| Cultural competence |
| Identification of children in the practice with SHCN |
| Care continuity |
| Cooperative management between PCP and specialist |
| Supporting the transition to adulthood |
| Care coordination/role definition |
| Assessment of needs/plans of care |
| Community assessment of needs for CSHCN |
| Quality Standards |

SHCN: Special health care needs
CSHCN: Children with special health care needs

**Fig. 1** Medical Home Index-Short Version indicators. *SHCN* special health care needs, *CSHCN* children with special health care needs and Level 3 is comprehensive care. Scores range from one to five with higher scores indicating greater levels of the attribute, resulting in a total score for all ten items ranging from 10 to 50. The MHI was distributed to staff in each clinic before implementation of CC and then annually, concluding with a final survey at the end of the contract. Staff completing the MHI included physicians, nurses, care coordinators, and clerks.

The study did not involve review of individual patient records and therefore did not require submission to the Louisiana State University Health Sciences Center or Office of Public Health Institutional Review Boards.

## Clinic Selection

All primary care pediatric, medicine-pediatric, and family medicine outpatient clinics from the three medical schools in the state (LSU New Orleans, LSU Shreveport, and Tulane) were invited to participate. Using academic practices had many advantages. The majority of patients in Louisiana's academic clinics are Medicaid funded, in contrast to private practices which are more likely to serve patients with private insurance. Data indicate that publically insured children in Louisiana have greater unmet need for care coordination (Maternal and Child Health Bureau in collaboration with the National Center for Health Statistics 2011). Second, academic faculty are more likely to apply for small grants that encourage innovative practices. We hypothesized that practices that received incentive funding would be more likely to sustain the model when funding ceased. Finally, we postulated that by implementing CC in academic clinics, residents would become familiar with public health and community resources, internalize CC as part of their "gold standard", and be more likely to provide CC in their post-residency practices.

## The CSHS CC Model

The Title V CSHS care coordinator supervisor conducted a 1 h CC orientation for clinic faculty physicians and staff and a half day one-on-one care coordinator training. The CSHS CC model is flexible to permit adaptability to various practice settings. The model is described below and in Fig. 2. Greater detail can be found in the CSHS CC Toolkit (Louisiana Children's Special Health Services Program 2015).

Children's Special Health Services (CHCS) provided each practice with region-specific public health and community resource information including contact information, program brochures/applications, and form letters for schools requesting 504 accommodations and special education evaluations. The care coordinator cataloged resources in a file easily accessible to all clinic staff. Resource libraries grew over time as educational handouts were added and program materials were updated and expanded. Thus the entire practice became engaged in improved CC for all patients, encouraging a team approach.

## Identification of CYSHCN

In accordance with the 2003 NICHQ MH Learning Collaborative, the CSHS CC model used the CSHCN Screener to identify CYSHCN (Child and Adolescent Health Measurement Initiative 2008) in the practice. The CSHCN Screener is a five item parent report tool developed by the Child and Adolescent Health Measurement Initiative utilizing the MCHB definition of CSHCN: children who "have or are at increased risk for chronic physical, developmental, behavioral, or emotional conditions that required health and related services of a type or amount beyond that required by children generally" (McPherson et al. 1998). CSHS modified the literacy level of the screener after pretesting (Fig. 3). Use of a screener identifies CYSHCN systematically across the practice, without dependence on physician identification and referral. The care coordinator interviewed parents of any child with a positive screener to assess need for CC. If the care coordinator was unavailable during the clinic visit, the interview was conducted by phone, preferably within 48 h. Children who were not identified by screener but failed developmental screening tests during the visit were also identified as CYSHCN, to ensure successful referral to early intervention and follow up.

## Stratification by Level of CC Need

For newly identified CYSHCN, the care coordinator completed a brief assessment with the parent to determine needed services, using the optional CSHS CC Assessment of Needs Form (Fig. 4). Patients were stratified into either Level 1 or Level 2 based on their complexity of needs (Fig. 5). Level 1 patients included children and youth with low/moderate complexity of needs, such as laboratory and sub-specialty referrals commonly handled by clinic staff without the assistance of the care coordinator. Level 2 patients had more complex needs that required care coordinator expertise and/or time. Level of complexity could fluctuate between visits. By stratifying the CYSHCN population within the clinic, the care coordinator could focus her time on those patients with the greatest CC need.

## Care Plans

For Level 2 patients, the care coordinator worked with the family, physician, and other members of the healthcare team, depending on the staff mix, to develop written care plans. Care plans addressed medical, subspecialty,

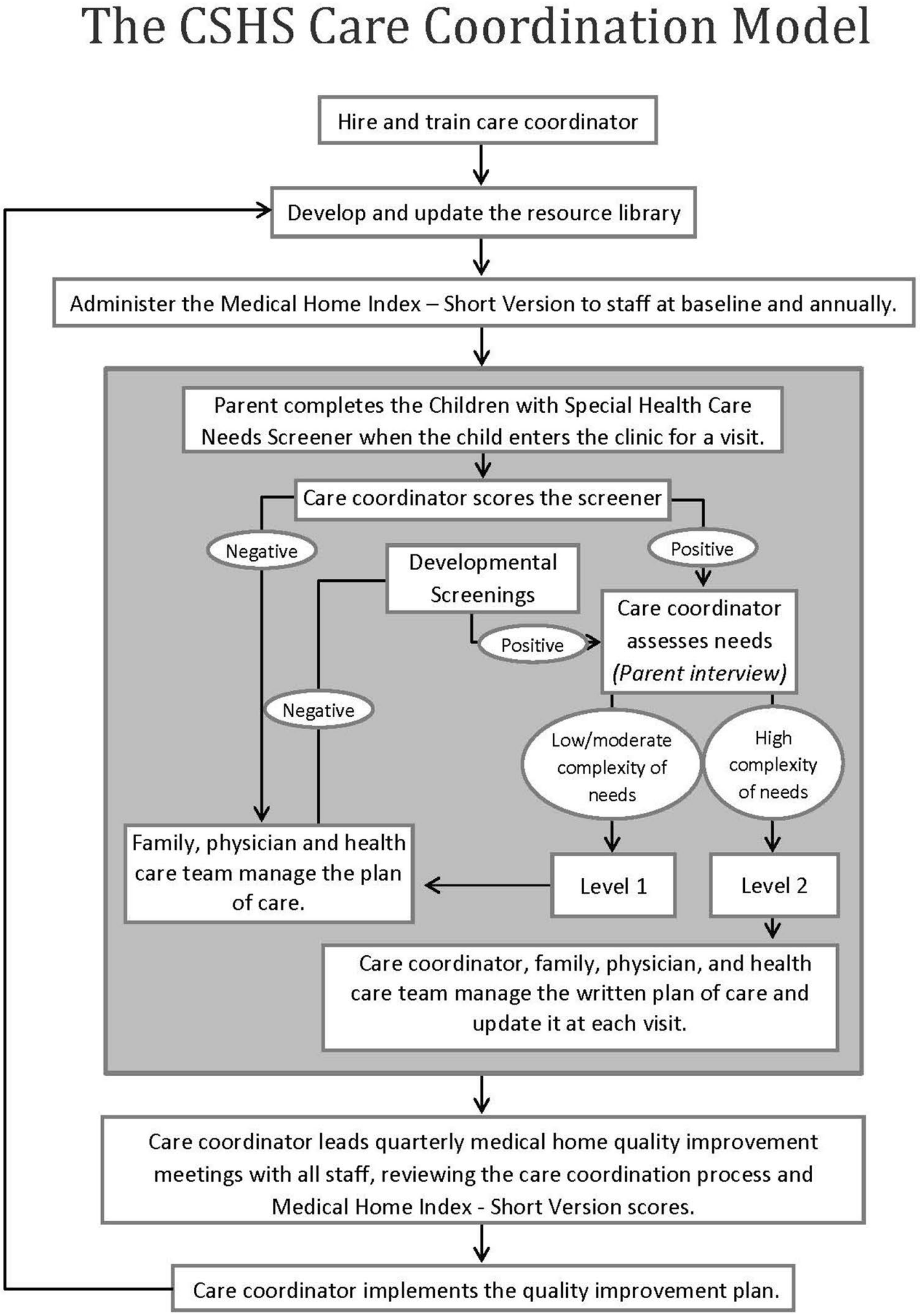
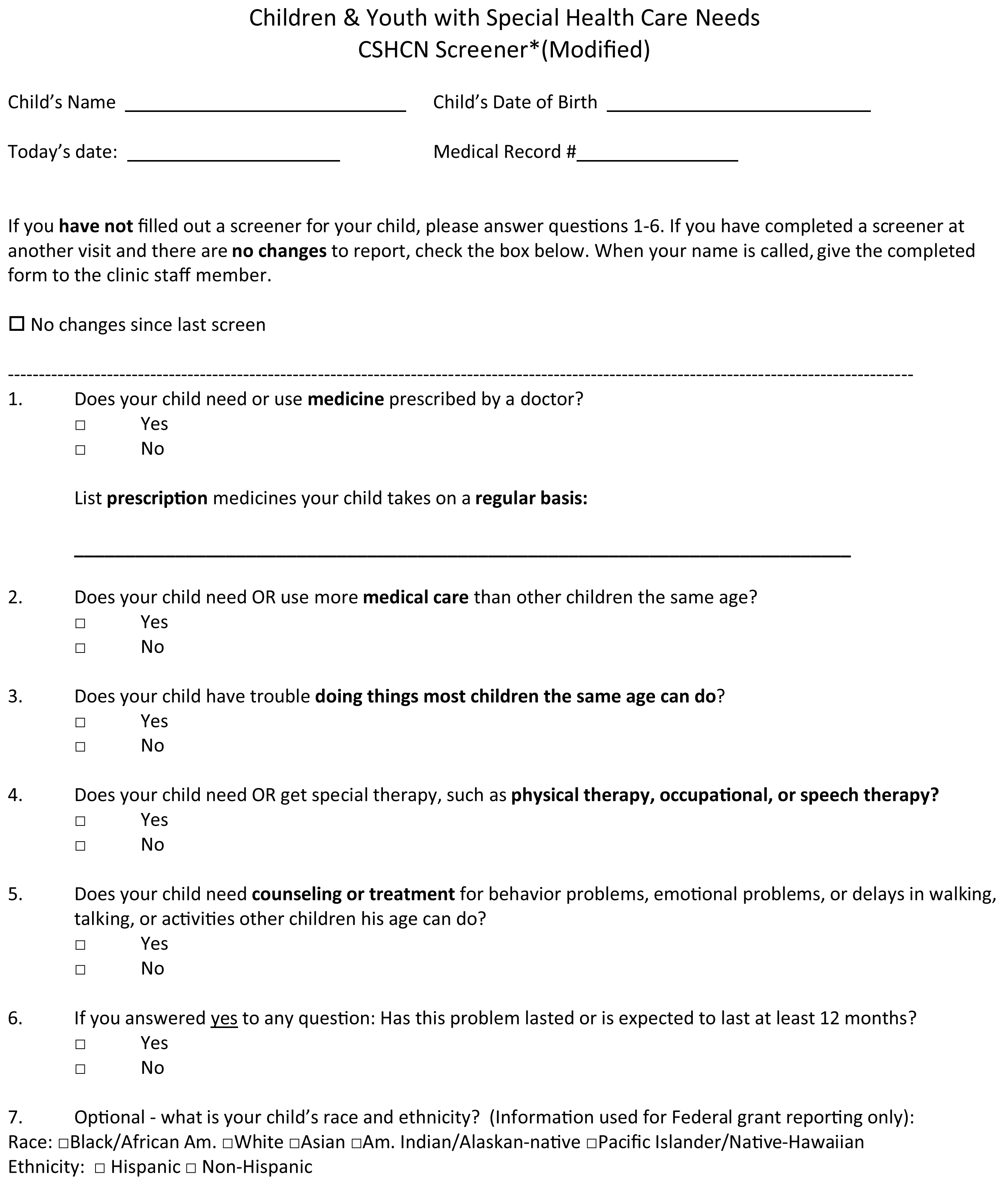


**Fig. 2** Children's Special Health Services care coordination model

mental health, community, public health, family support, and healthcare education needs. The care coordinator joined the physician in the exam room to determine appropriate referrals, identify barriers, and provide educational and family support resources to encourage successful follow through. Subspecialty appointments were frequently made for the family by the care coordinator or front desk staff. Care plans reflected identified needs, referrals made, status of referrals, and education/counseling provided and were documented in the Electronic Health Record (EHR) or separate CC database. Level 2 patients were flagged in the EHR or with a chart sticker to alert staff to their need to meet with the care coordinator at each clinic visit. In some clinics, the separate database or EHR calendar provided prompts to alert the care coordinator when follow-up was needed.



Children & Youth with Special Health Care Needs
CSHCN Screener*(Modified)

Child's Name ______________________________ Child's Date of Birth ____________________________

Today's date: ______________________ Medical Record #_________________

If you **have not** filled out a screener for your child, please answer questions 1-6. If you have completed a screener at another visit and there are **no changes** to report, check the box below. When your name is called, give the completed form to the clinic staff member.

☐ No changes since last screen

1. Does your child need or use **medicine** prescribed by a doctor?
   ☐ Yes
   ☐ No

   List **prescription** medicines your child takes on a **regular basis:**

   ____________________________________________________________________________________

2. Does your child need OR use more **medical care** than other children the same age?
   ☐ Yes
   ☐ No

3. Does your child have trouble **doing things most children the same age can do**?
   ☐ Yes
   ☐ No

4. Does your child need OR get special therapy, such as **physical therapy, occupational, or speech therapy?**
   ☐ Yes
   ☐ No

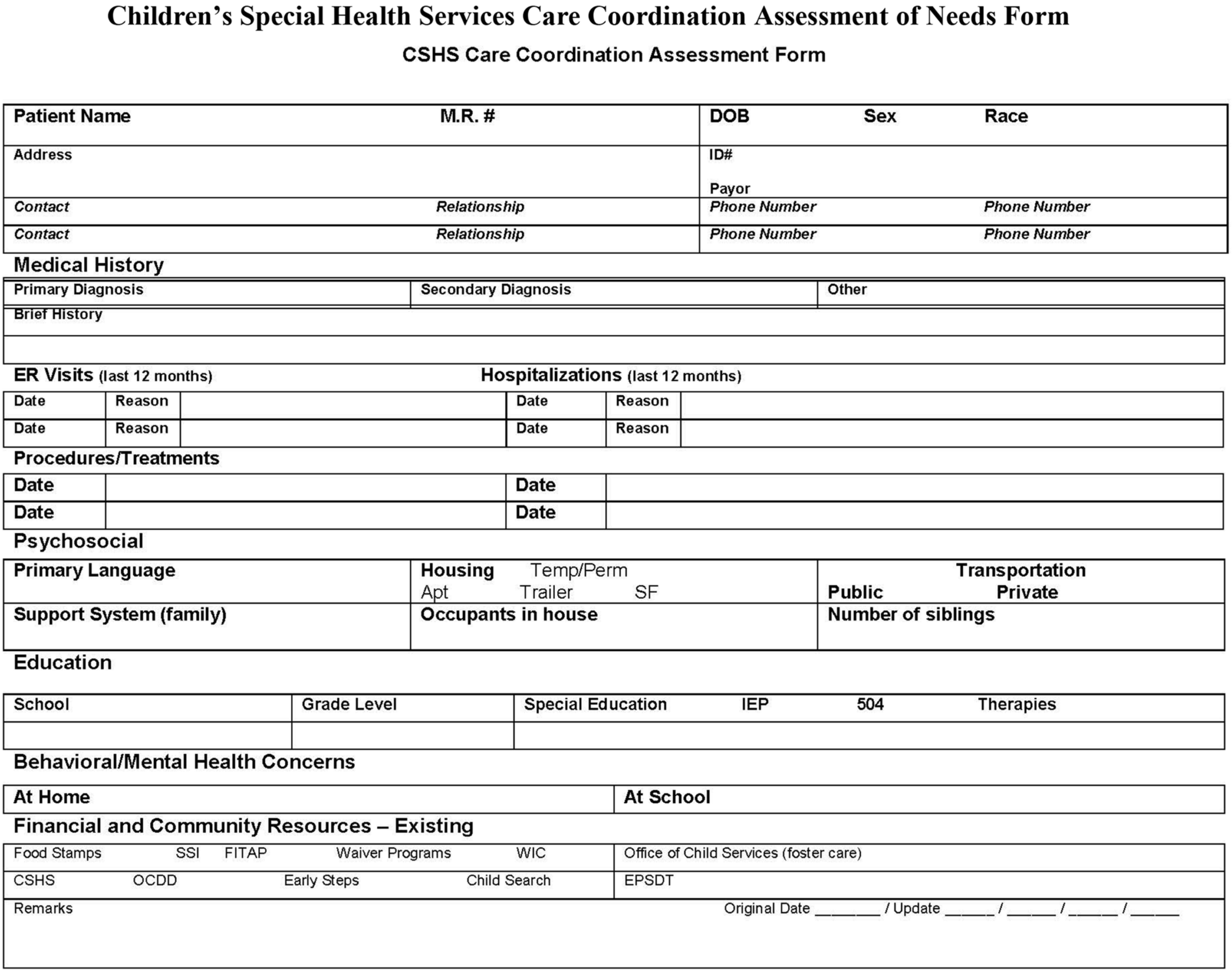
5. Does your child need **counseling or treatment** for behavior problems, emotional problems, or delays in walking, talking, or activities other children his age can do?
   ☐ Yes
   ☐ No

6. If you answered yes to any question: Has this problem lasted or is expected to last at least 12 months?
   ☐ Yes
   ☐ No

7. Optional - what is your child's race and ethnicity? (Information used for Federal grant reporting only):

Race: ☐Black/African Am. ☐White ☐Asian ☐Am. Indian/Alaskan-native ☐Pacific Islander/Native-Hawaiian
Ethnicity: ☐ Hispanic ☐ Non-Hispanic

**Fig. 3** CSHCN screener. *Modified from the CSHCN Screener—Child and Adolescent Health Measurement Initiative (CAHMI) www.cahmi.org (Rev 2011/2014 LA CSHS)



**Children's Special Health Services Care Coordination Assessment of Needs Form**

**CSHS Care Coordination Assessment Form**

| | | | | |
|---|---|---|---|---|
| **Patient Name** | **M.R. #** | **DOB** | **Sex** | **Race** |
| Address | | ID#<br>Payor | | |
| *Contact* | *Relationship* | *Phone Number* | | *Phone Number* |
| *Contact* | *Relationship* | *Phone Number* | | *Phone Number* |

**Medical History**

| | | |
|---|---|---|
| Primary Diagnosis | Secondary Diagnosis | Other |
| Brief History | | |
| | | |

**ER Visits** (last 12 months) **Hospitalizations** (last 12 months)

| | | | | | |
|---|---|---|---|---|---|
| Date | Reason | | Date | Reason | |
| Date | Reason | | Date | Reason | |

**Procedures/Treatments**

| | | | |
|---|---|---|---|
| **Date** | | **Date** | |
| **Date** | | **Date** | |

**Psychosocial**

| | | |
|---|---|---|
| **Primary Language** | **Housing** Temp/Perm<br>Apt Trailer SF | **Transportation**<br>**Public** **Private** |
| **Support System (family)** | **Occupants in house** | **Number of siblings** |

**Education**

| | | |
|---|---|---|
| **School** | **Grade Level** | **Special Education** **IEP** **504** **Therapies** |
| | | |

**Behavioral/Mental Health Concerns**

| | |
|---|---|
| **At Home** | **At School** |

**Financial and Community Resources – Existing**

| | |
|---|---|
| Food Stamps SSI FITAP Waiver Programs WIC | Office of Child Services (foster care) |
| CSHS OCDD Early Steps Child Search | EPSDT |
| Remarks | Original Date _______ / Update _____ / _____ / _____ / _____ |

**Fig. 4** Children's Special Health Services care coordination assessment of needs form

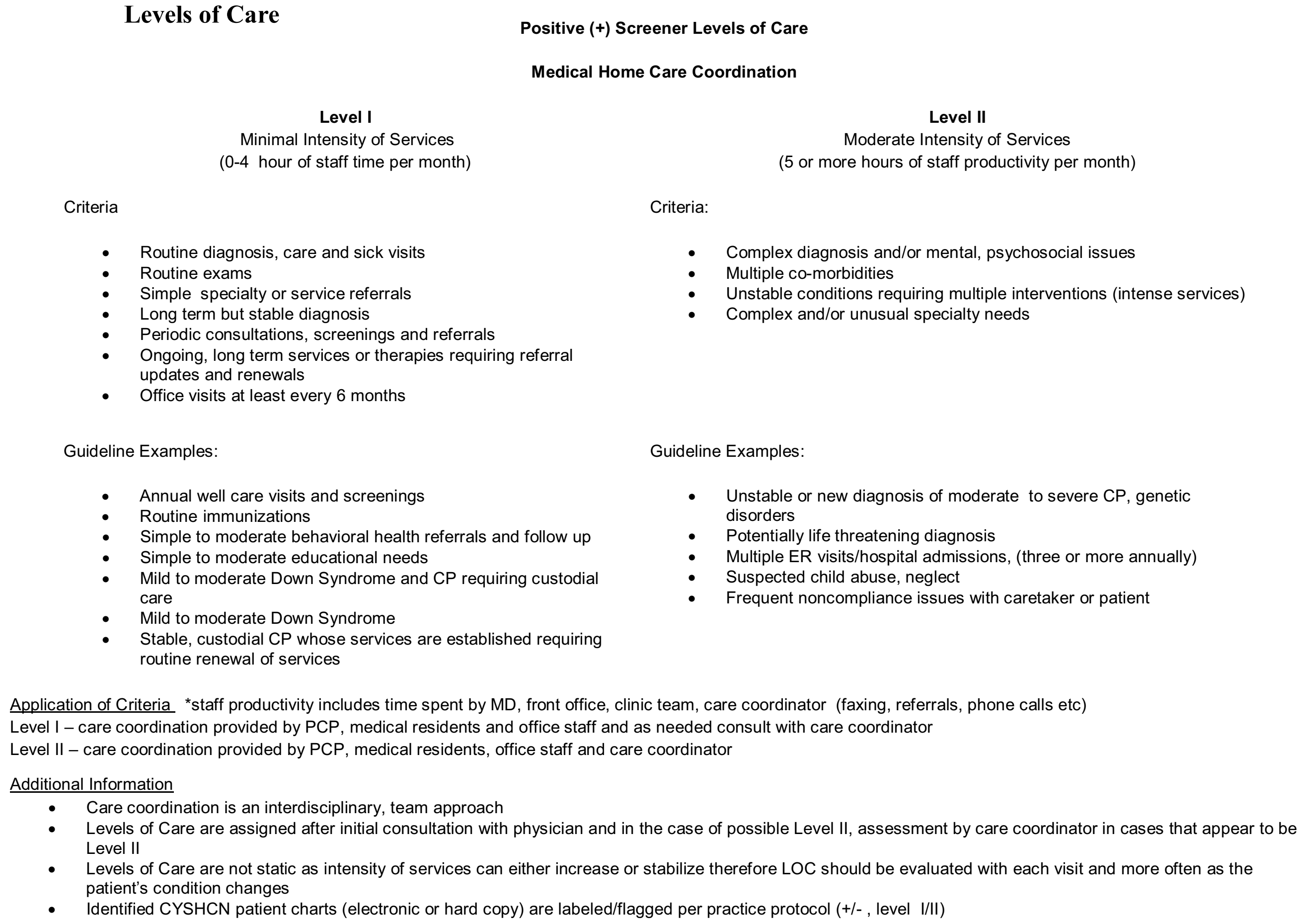
## Quality Improvement (QI) Meetings

Care coordinators were required to lead quarterly "MH" meetings with practice staff focused on improving MH capacity of the practice. Low scoring MHI-SV indicators were prioritized for QI. The care coordinator worked with practice staff to determine QI initiatives, which were led by the care coordinator. Care coordinators were offered tools such as Plan-Do-Study-Act cycles to inform QI processes (15). The care coordinator supervisor attended two QI meetings annually to monitor practice progress, although extent of QI activities was left to practice discretion.

## Contract Requisites

Title V fully funded care coordinator salaries for the first three contracted practices and assisted these practices in selecting and hiring care coordinators. Care coordinators were required to have a Bachelors/Master degree in a health related field and at least 2 years of CC experience. Because full funding was not be financially feasible for CSHS, the remaining 12 practices received $20,000 the first year and $10,000 the second year. These practices were required to select an existing staff member as their care coordinator, allotting a minimum of 20 h per week to CC activities. This person could be a nurse, social worker or someone already coordinating referrals for the practice. The CYSHCN program provided clinics with the training, methodology, tools, and resources required to implement the CC program.

Care coordinators were required to implement the model using the tools provided, hold quarterly QI meetings with practice staff, conduct baseline and annual MHI surveys of practice staff, and submit quarterly statistical reports.



**Levels of Care**

**Positive (+) Screener Levels of Care**

**Medical Home Care Coordination**

**Level I**
Minimal Intensity of Services
(0-4 hour of staff time per month)

Criteria

- Routine diagnosis, care and sick visits
- Routine exams
- Simple specialty or service referrals
- Long term but stable diagnosis
- Periodic consultations, screenings and referrals
- Ongoing, long term services or therapies requiring referral updates and renewals
- Office visits at least every 6 months

Guideline Examples:

- Annual well care visits and screenings
- Routine immunizations
- Simple to moderate behavioral health referrals and follow up
- Simple to moderate educational needs
- Mild to moderate Down Syndrome and CP requiring custodial care
- Mild to moderate Down Syndrome
- Stable, custodial CP whose services are established requiring routine renewal of services

**Level II**
Moderate Intensity of Services
(5 or more hours of staff productivity per month)

Criteria:

- Complex diagnosis and/or mental, psychosocial issues
- Multiple co-morbidities
- Unstable conditions requiring multiple interventions (intense services)
- Complex and/or unusual specialty needs

Guideline Examples:

- Unstable or new diagnosis of moderate to severe CP, genetic disorders
- Potentially life threatening diagnosis
- Multiple ER visits/hospital admissions, (three or more annually)
- Suspected child abuse, neglect
- Frequent noncompliance issues with caretaker or patient

Application of Criteria *staff productivity includes time spent by MD, front office, clinic team, care coordinator (faxing, referrals, phone calls etc)
Level I – care coordination provided by PCP, medical residents and office staff and as needed consult with care coordinator
Level II – care coordination provided by PCP, medical residents, office staff and care coordinator

Additional Information

- Care coordination is an interdisciplinary, team approach
- Levels of Care are assigned after initial consultation with physician and in the case of possible Level II, assessment by care coordinator in cases that appear to be Level II
- Levels of Care are not static as intensity of services can either increase or stabilize therefore LOC should be evaluated with each visit and more often as the patient's condition changes
- Identified CYSHCN patient charts (electronic or hard copy) are labeled/flagged per practice protocol (+/- , level I/II)

**Fig. 5** Levels of care

### Analysis Methods

MHI-SV improvement was determined by the difference in mean score pre- and post-implementation. Linear regression was used to evaluate MHI-SV improvement. In adjusted models, all clinic characteristics were included. Interaction terms were included in separate regression models to compare MHI-SV improvement between clinic characteristic levels. Statistical significance was set at $p \leq 0.05$ for main effects and $\leq 0.10$ for interaction terms. Analyses were done using SAS 9.4.

## Results

### Clinic Characteristics

Of the 15 original clinics that implemented the model, the three that received full funding were able to hire and retain a care coordinator. 5 of the 12 that received incentive funding could not retain a care coordinator. Frequently, the practices' parent company would move trained care coordinators to other locations.

Ten of the 15 practices participated in the intervention for 2 or more years between 2008 and 2014 and were included in the final analysis. Several practices chose to delay participation due to rapidly evolving health care changes in the state, including a transition to Medicaid Managed Care, electronic health record (EHR) roll out, and state funding cuts. Four practices were excluded because they had not completed their second year of implementation at the time of analysis; a fifth practice discontinued the CSHS CC model after extensive staff turnover.

Characteristics of the ten clinics are presented in Table 1.

### MH Capacity Improvement

In ten clinics analyzed, a total of 76 MHI-SV surveys were completed at baseline and 66 completed post-intervention. All clinics demonstrated improvement in total MHI-SV scores with improvement in eight clinics reaching statistical

**Table 1** Clinic characteristics

| Clinic characteristics | Number of clinics (10) | Number of MHI-SV responses (%) (N = 142) |
|---|---|---|
| Care coordinator professional background | | |
| Social worker | 6 | 90 (63%) |
| Nurse | 2 | 37 (26%) |
| Other[a] | 2 | 15 (11%) |
| Geographical area | | |
| Urban[b] | 8 | 111 (78%) |
| Rural | 2 | 31 (22%) |
| Clinic population served | | |
| Full clinic population | 7 | 110 (77%) |
| Pediatric subpopulation | 3 | 32 (23%) |
| Used a separate CC database | | |
| Yes | 5 | 145 (54%) |
| No | 5 | 126 (46%) |
| EHR rollout during CC implementation | | |
| Yes | 5 | 42 (30%) |
| No | 5 | 100 (70%) |
| Significant staff turnover | | |
| Yes | 5 | 98 (69%) |
| No | 5 | 44 (31%) |
| Percent of patients who have public insurance | | |
| ≥83 | 8 | 112 (79%) |
| <83 | 2 | 30 (21%) |
| Number of years in intervention (years) | | |
| 2 | 7 | 92 (65%) |
| 4 | 2 | 31 (22%) |
| 5 | 1 | 19 (13%) |

Number of MHI-SV responses includes pre and post intervention surveys

*EHR* electronic health record, *CC* care coordination

[a] "Other" professional backgrounds include early interventionist (MEd) and residents

[b] Urban is defined as a parish with at least 80% of the population in area defined by the census bureau as urban

significance (Fig. 6). When MHI-SV scores were averaged across all clinics, each of the ten MHI-SV indicators showed statistically significant improvement (Fig. 7). The indicators with the most improvement were identification of CYSHCN in the practice, assessment of needs/plans of care, community assessment of needs for CYSHCN, and CC/role definition. The mean total MHI-SV score of ten clinics improved from 19.70 points at baseline to 34.15

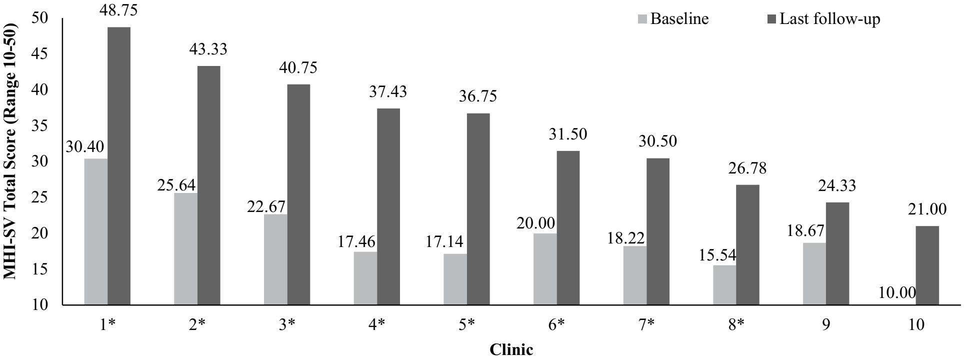


**Fig. 6** MHI-SV total score at baseline and last follow-up for ten clinics. *Statistically significant difference ($p < .05$) between baseline and last follow-up MHI-SV score

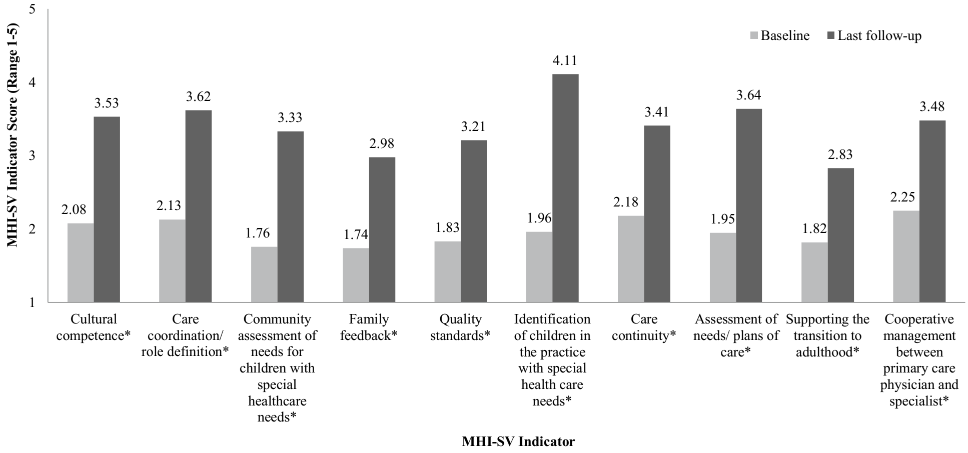


**Fig. 7** Mean MHI-SV score by indicator in ten clinics at baseline and last follow-up after care coordination intervention. *Statistically significant difference (p < .05) between baseline and last follow-up MHI-SV score

points post intervention (scale 10–50). Adjusted total mean MHI-SV improvement was 13.12 (CI 10.27–15.97).

## Association of Clinic Characteristics with MH Capacity Improvement

Of the clinic characteristics analyzed, models with interaction terms indicate only three clinic characteristics had statistically significant different effects on MHI-SV improvement between characteristic strata (interaction $p \leq 0.10$). MHI-SV improvement was greater in clinics in a rural location, with a social worker or nurse care coordinator, or with no key staff (care coordinator or physician) turnover (Table 2). The five clinics with key staff turnover demonstrated less MHI-SV improvement. After difficulty keeping a care coordinator, one clinic had residents assume the CC role. This clinic was one of only two clinics that did not have a statistically significant improvement in MHI-SV.

**Table 2** Crude and adjusted difference in Mean MHI-SV total score between baseline and last follow-up

| Clinic characteristics | Mean MHI score difference between pre and post intervention (CI) | Interaction term p value | Adjusted Mean MHI score difference between pre and post intervention (CI) | Interaction term p value |
|---|---|---|---|---|
| Geographical area | | | | |
| Rural | 19.8 (16.1–23.5) | | 19.1 (12.6–25.7) | |
| Urban | 13.0 (9.6–16.4) | 0.0517 | 11.7 (8.6–14.7) | 0.0271 |
| Care coordinator professional background | | | | |
| Nurse | 13.4 (9.4–17.3) | | 13.3 (10.4–16.2) | |
| SW | 19.5 (16.1–22.9) | 0.0756 | 15.4 (8.9–21.9) | 0.5454 |
| Other | 8.4 (0.33–16.52) | 0.2826 | 0.38 (-8.7-9.4) | 0.0065 |
| EHR rollout during CC implementation | | | | |
| Yes | 16.2 (11.0-21.4) | | 13.2 (6.7–19.7) | |
| No | 13.5 (10.2–16.7) | 0.3637 | 12.4 (9.3–15.5) | 0.8224 |
| Clinic population served | | | | |
| Full clinic population | 14.3 (11.0-17.5) | | 12.9 (9.8–15.9) | |
| Pediatric sub-population only | 14.0 (9.0–19.0) | 0.9317 | 8.9 (1.6–16.2) | 0.2826 |
| Separate CC database used | | | | |
| Yes | 13.2 (8.9–17.5) | | 11.5 (7.7–15.4) | |
| No | 15.8 (12.2–19.4) | 0.3651 | 13.6 (9.6–17.5) | 0.4245 |
| Significant staff turnover | | | | |
| Yes | 12.6 (9.5–15.7) | | 12.0 (6.7–17.3) | |
| No | 17.8 (12.9–22.8) | 0.0693 | 16.8 (9.6–24.0) | 0.0830 |

*Regression model was adjusted for geographical area, CC professional background, EHR rollout during CC, clinic population served, outside CC database used, and key staff turnover

*EHR* electronic health record, *CC* care coordination, CI 95% confidence interval

A variable describing level of funding received by the clinic was associated with key staff turnover and whether the care coordinator served all patients, and therefore, was not included as a predictor in the final model.

## Discussion

This study presents a replicable method for implementation of CC in pediatric primary care practices that consistently improved MH capacity across different academic clinic settings, demonstrating the power of CC as a driver of MH transformation. Meetings led by the care coordinator served to motivate the practice to improve the MHI. While the intervention focused on CC, its inherent QI process resulted in significant improvement in all ten indicators of the MHI-SV.

McAlister et al. (2013) analyzed 12 practices that participated in the original 2003 National Learning Collaborative and identified four essential attributes as drivers of MH transformation. These drivers include: (1) culture of QI, (2) family-centered care with parents as improvement partners (3) team-based care and (4) care coordination. This model contained all of these essential elements, with the exception of parents as improvement partners. Our impression is that since care plans were developed in partnership with parents, the addition of CC was viewed as a significant improvement in family centered care.

The rapidly changing health care environment in Louisiana presented many challenges to implementation of CC. These changes resulted in closure of two clinics after this data collection, staff turnover, and in many practices, simultaneous implementation of CC and EHR systems. Consequently, the study highlighted many practical factors to consider in planning effective CC interventions.

### Staff Turnover and Funding for CC

The first consideration is stability of key staff, which was linked to improvement in MH capacity. When full salary support was provided, the practice was able to hire and retain a care coordinator. In the clinic where residents were given the CC responsibilities, mean MHI did not show a statistically significant improvement, suggesting the need for a dedicated care coordinator within the practice. The importance of funding reform to support CC is supported by the Catalyst Center (Bachman et al. 2015) and Arend et al. (2012) in two excellent overviews of funding options for CC.

This study was limited to academic practices. One might hypothesize that community practices may have fewer CYSHCN and therefore not justify the cost of a care coordinator. Our Title V program has begun to work with a Medicaid MCO to implement CC in three rural community pediatric practices. The MCO will fund a licensed social worker for each practice, who will provide both CC and reimbursable mental health services. Should this model prove financially sustainable, it will provide a model to improve both MH capacity and behavioral health integration in community practices throughout the state.

### Care Coordinator Professional Background

In this study, all care coordinators were effective at increasing MHI scores; clinics with social workers had the greatest improvement, followed by nurses. The difference between social workers and nurses was not significant after adjusting for clinic characteristics. Care coordinators frequently assumed additional responsibilities, depending on clinic volume and staffing needs. For example, in two clinics, the care coordinator distributed and scored developmental screening tests. Children with concerns became Level 2 patients until medical and early intervention referrals were complete.

### Rural versus Urban

Data indicated that rural practices were more likely to improve MHI-SV than urban in the areas of family feedback, CC, and continuity of care. The Louisiana Title V 2010 CYSHCN Needs Assessment indicated that urban families had more unmet need for CC than rural families. Rural areas have fewer resources to navigate. Therefore, implementation in rural areas may be the “low hanging fruit” in improving MH capacity.

### Clinic Characteristics of Statistical Non-Significance

Study data did not support associations between MH improvement and simultaneous EHR rollout, use of a separate CC database, or whether the intervention involved the entire clinic population or a subset, possibly due to small sample size. Each of these characteristics had practical implications which are discussed below.

### Separate CC Database and Effect of EHR Roll-Out

The first three clinics were provided an ACCESS CC database which provided daily to-do-lists and assisted with tracking of all Level 2 CYSHCN care plans. However, the database could only be accessed by the care coordinator. Integrating care plans into existing records, whether paper or electronic, permitted all clinic staff to view the care plan, leading to a more coordinated, efficient approach to CC. Use of a separate database did not demonstrate a significant effect on MHI improvement; however our small sample size may have attenuated the effects. Richardson studied effect of EHRs on CC in three practices and noted that homegrown tools that existed apart from the EHR provided barriers in notifying care coordinators of a patient's status (Richardson et al. 2015). Clinics that attempted simultaneous implementation of an EHR and the CSHS CC model struggled to master the two new systems. For example, paper tools for youth transitioning to adulthood were abandoned pending integration into the EHR. Despite the difficulty, a negative effect on MHI was not observed, possibly because of the positive effect of the EHR itself on CC. We recommend selecting clinics that have experience with the EHR before implementing another system-changing intervention. We agree with Richardson that CC would be enhanced by further development of EHR systems to enable monitoring of patient populations, notification of care transitions, collaboration between staff, patients, and referral agencies, reporting of outcome data, and interoperability between systems (Richardson et al. 2015). None of these functions were optimized in our clinics at the time of this study.

### Clinic Population Served

A factor observed in practice that was hypothesized to affect the improvement of MHI scores was whether the clinic served only pediatric primary care patients or also served subspecialty patients or adult patients. CC was only offered to CYSHCN receiving primary care services and continued until they had completely and successfully transitioned to adult services. The data showed no difference in MHI improvement between these clinic types. An expanded MH model could have provided CC services to adults and to subspecialty patients as well.

### Study Strengths and Limitations

Despite the changing healthcare landscape in Louisiana throughout the 7 year study, this flexible and easy to implement CC model was successfully implemented in ten academic practices. This study describes how integrating CC can improve MH capacity in diverse academic pediatric practices under frequently challenging administrative conditions such as EHR implementation, budget cuts, and staff changes.

Several study limitations relate to the use of the MHI. The MHI is intended to be reported as a consensus score among practice participants, rather than discreet respondents. Using discreet respondents permitted statistical determination of the effect modifiers, but is a modification from the original intention of the validated tool. Other limitations are the variation in number of respondents per clinic and the small number of respondents, which may have attenuated the power of the statistical tests. The MHI-SV is a subjective self-evaluation tool and therefore has the potential for bias. Finally, degrees of adherence to the CSHS Model may also affect the change in MHI.

While our pilot study (Berry et al. 2011) demonstrated overwhelming improvement in family satisfaction with both the CC and the practice, family surveys were not included in this study. Validation of improved family satisfaction would have strengthened the evidence for success of the model. In the 2003 MH Learning Collaborative, practices utilized parent partners to provide feedback to practices. We did not, in part because the introduction of CC alone represented a significant change for these practices. Because the care coordinator engaged in shared decision making with the family to identify needed resources, address barriers to care, and assist with follow through, we believe that CC alone can make a practice more family-centered. Parent partners may have facilitated additional improvement in family-centered care.

## Conclusion

This study offers a replicable model for improving MH capacity through implementation of CC at the practice level, and addresses several practical factors to maximize success. Presence of an electronic health record, lack of physician or care coordinator turnover, and rural location were associated with greater improvement in MH capacity. Consistent funding for CC proved critical to ensure stability of the care coordinator position. At least two pediatric studies have correlated increased MHI with cost savings and decreased hospitalizations (McAllister et al. 2007; Cooley et al. 2003; Treadwell and Giardino 2014), suggesting that funding CC in primary care practices may result in both improvement in MH capacity and cost savings in pediatric populations. Title V Programs can be instrumental in implementing CC in practices.

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**Compliance with Ethical Standards**

**Conflicts of interest** The author declares that they have no conflicts of interest.

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