




## Connecting the Dots for Children with Medical Complexity

### A Tertiary Care Hospital-Based Medical Home

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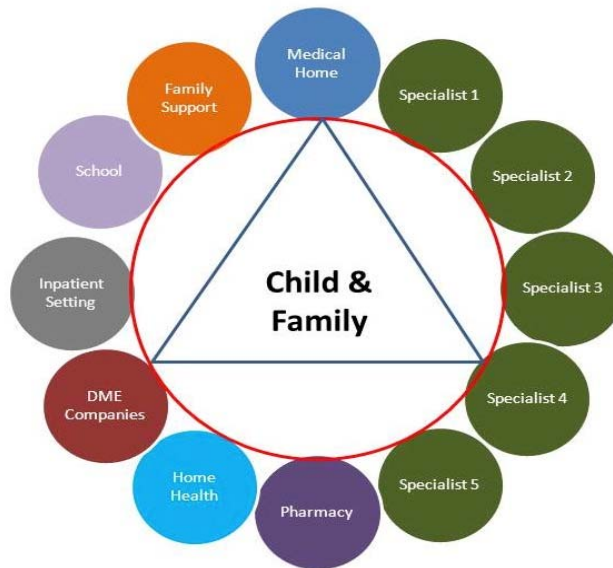


## Disclosures



- I have nothing to disclose
- Patient stories and photos are presented with permission from parents

## Child with Medical Complexity (CMC)



AHRQ White Paper: Medical Neighborhood

## Disproportionate Cost and Risk



- A small number of CMC account for a disproportionate amount of medical cost
- Hospital care is a large driver of cost
- Transitions of care for CMC increase risk for medical error
- Families of CMC report significant unmet needs
- CMC with high hospital utilization may benefit from enhanced care coordination and a value based approach

*Health Affairs* 33, no. 12 (2014):2199-2206  
*JAMA Pediatr* . 2013 February ; 167(2): 170-177  
*Pediatrics* 2012;130:e1463-e1470  
*JAMA*. 2011;305(7):682-690  
*NEJM* 2016; 374(16):1543

## Program Goal and Evaluation Objective

### Program Goal

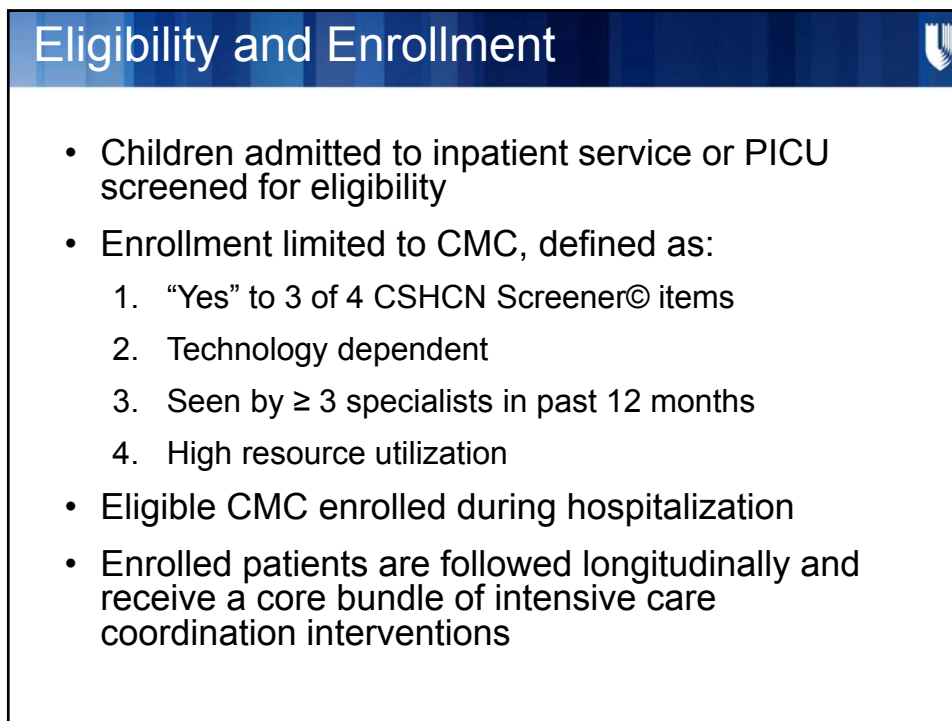
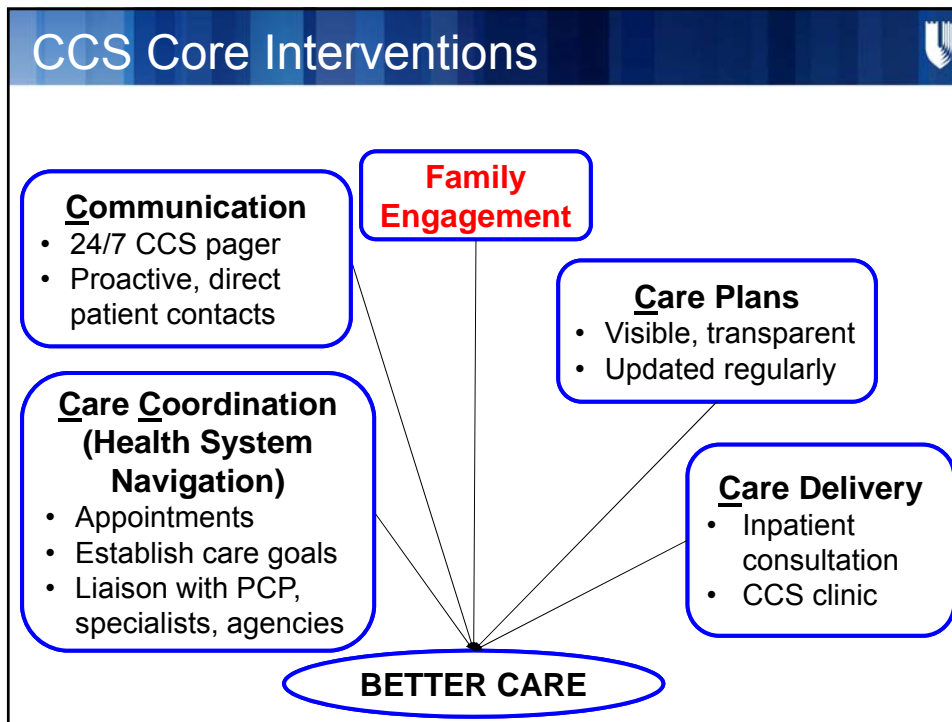
Deliver high quality, efficient, and coordinated care across the inpatient/outpatient continuum for children with medical complexity (CMC)

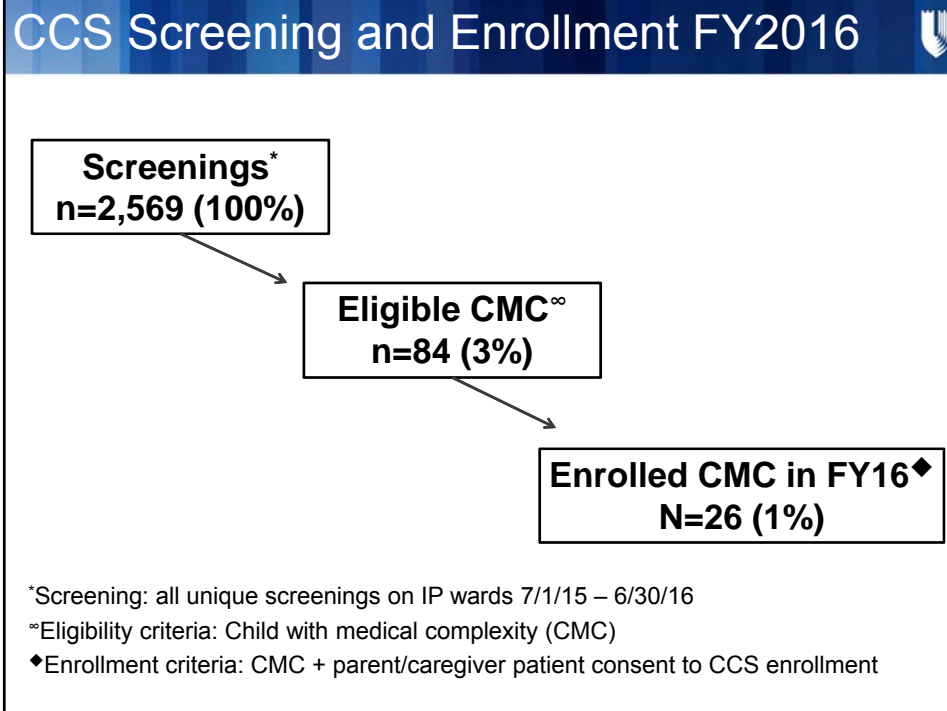
### Study Objective

To determine if a tertiary care hospital-based medical home can reduce hospital utilization and cost for CMC with high hospital utilization

## Complex Care Service at Duke

- Tertiary care hospital-based medical home for CMC
  - Launched September 2014
  - Specialty care centered at Duke
  - Not already part of an existing specialty program
- Multi-disciplinary, longitudinal care delivery
- Inpatient and outpatient presence
- Does not supplant primary care





## Study design

- Observational study of enrolled patients
- Analysis limited to patients with  $\geq 60$  days post-enrollment data in fiscal year 2016
  - Hospital utilization calculated as annualized rates
  - Acute care encounters prevented by CCS were identified at the point of care
  - Hospital days avoided were calculated for subgroup who received end-of-life care

## Demographics



### Patient Characteristics

<b>Total patients, n*</b>	53
<b>Age (years), median (min, max)</b>	6 (0,16)
<b>Race/Ethnicity, n (%)</b>	
Black or African American	22 (41.5)
Caucasian/White	26 (49.1)
Multiracial	2 (3.8)
Other <sup>∞</sup>	3 (5.7)
<b>Insurance, n (%)</b>	
Medicaid	39 (73.6)
Private	14 (26.4)

\*As of 6/30/16, including 9 disenrolled patients

<sup>∞</sup>Includes Asian, American Indian, and Other

## Impact – Clinical



### Hospital Utilization – Annualized (through FY16)

<u>Measure</u>	CCS Enrollees (n=46)*		<u>p-value</u>
	<u>Pre-CCS</u>	<u>Post-CCS</u>	
Admissions	2 (0.4, 11.7)	0.9 (0, 11.5)	<b>0.0425</b>
Length of stay	9.2 (1.5, 250)	2.0 (0, 51)	<b>&lt;0.0001</b>
Hospital days	18.4 (0.8, 361)	5 (0, 250)	<b>&lt;0.0001</b>
Days at home	347 (5, 365)	361 (116, 366)	<b>&lt;0.0001</b>

\*Limited to CCS enrollees with ≥60 days post-enrollment data.

p-Values are based on the signed rank test; values are median (min, max)

## Impact – Clinical



## Readmissions (through FY16)

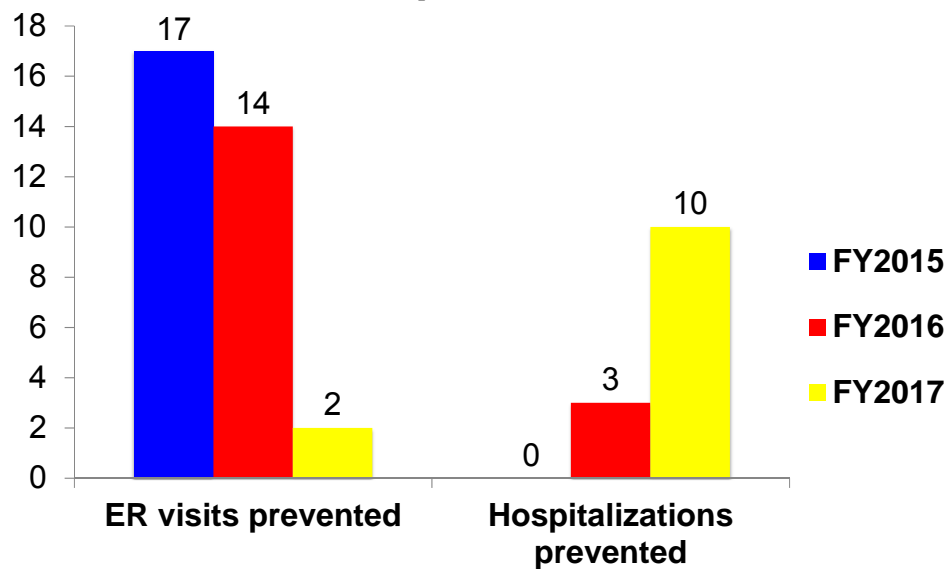
<u>Measure (%)</u>	CCS Enrollees (n=46)		<u>p-value</u>
	<u>Pre-CCS</u>	<u>Post-CCS</u>	
14 day readmission rate	22.9	25.4	0.68
<b>30 day readmission rate</b>	<b>33.1</b>	<b>33.8</b>	<b>0.92</b>
90 day readmission rate	53	56.3	0.64

*p-Values are based on the t-test*

## Impact – Clinical



## Acute Care Episodes Prevented



## Impact – Financial



## Hospital Costs – Annualized (through FY16)

	CCS Enrollees (n=46)		
<u>Measure</u>	<u>Pre-CCS</u>	<u>Post-CCS</u>	<u>p-value</u>
Total hospital costs <i>thousands \$</i>	175.8 (0.9, 987)	51.7 (0.0, 997)	<b>0.0003</b>
Cost per hospitalization* <i>thousands \$</i>	47.9 (1.5, 684)	24.3 (2.1, 203)	0.2991

*p-Values are based on the signed rank test*

*Values given are median (min, max)*

*\*N=26 patients with ≥1 admission in pre and post periods*

## Impact – Financial



## Aggregate Hospital Cost Savings FY2016

	CCS Enrollees (n=46)		
<u>Measure</u>	<u>Episodes post-enrollment</u>	<u>Cost saved per episode (\$)</u>	<u>Total savings (\$)</u>
Hospitalizations prevented	3	24,300	72,900
Hospitalizations	68	23,600	<b>1,604,800</b>



## Impact – End-of-Life Subgroup



### Cost Savings from Hospital Days Avoided

<u>Measure</u>	End-of-Life subgroup (n=3)		
	<u>Cost per Hospital Day</u> <i>thousands \$</i>	<u>Hospital Days</u> <u>Avoided</u>	<u>Cost Savings</u> <i>thousands \$</i>
Hospital Days Avoided (Total)	3.1	231	716.1
Hospital Days Avoided (Max 30 days)	3.1	90	<b>279</b>

## Impact – Financial



### Aggregate Hospital Cost Savings FY2016

<u>Measure</u>	CCS Enrollees (n=46)		
	<u>Episodes post-enrollment</u>	<u>Cost saved per episode (\$)</u>	<u>Total savings (\$)</u>
Hospitalizations prevented	3	24,300	72,900
Hospitalizations	68	23,600	1,604,800
Hospitalizations (EOL subgroup)	90	3,100	279,000
<b>Total hospital cost savings</b>			<b>1,932,400</b>

## Limitations



- Patient enrollment
  - CMC definition not formally validated
  - Potential for selection bias
- Pre/post design
  - Role of natural history of disease unclear
- Duke inpatient costs only
- Social complexity

## Results Summary



- Enrollment in CCS was associated with significant reductions in annualized admissions, length of stay, hospital days, and days spent at home.
- CCS core interventions prevented 19 acute care episodes for enrollees in FY2016
- Care by CCS team for enrolled CMC yielded almost \$2 million total cost savings in FY2016
- Intensive care provided by CCS for the small EOL subgroup yielded disproportionately large cost savings

## Conclusions



- CMC with high health care utilization enrolled in a tertiary care hospital-based medical home achieved significant reductions in hospital utilization and costs
- Core interventions delivered by CCS required substantial time and effort by a multi-disciplinary team
- Cost savings were disproportionately large for a small number of enrolled patients
- Opportunities exist to expand enrollment

## Acknowledgements



- Complex care patients and families
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