



# CHECK: A multi-level program to improve outcomes for urban children and youth with asthma

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**Title:** CHECK: A multi-level program to improve outcomes for urban children and youth with asthma

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Asthma is common diagnosis in children. Minority, urban children carry an unequal burden of asthma.<sup>1-2</sup> In Chicago, the overall asthma prevalence for children is 12.9% compared with 19.9% in predominately African American neighborhoods.<sup>2</sup> A community needs assessment showed 55.1% of children with asthma had at least one asthma-related unplanned urgent care or emergency visit in the past year with nearly half reporting difficulty accessing care.<sup>3</sup>

The Coordinated Healthcare for Complex Kids (CHECK) program has community health workers (CHW) who provide care coordination services for children and young adults with chronic disease. Enrollment began in December 2014 and ended September 2017. Medicaid managed care organizations and providers referred patients from birth to 25 years with a diagnosis of asthma, sickle cell disease, prematurity, and diabetes to CHECK. Most patients were residents of Cook County, Illinois, with a clear concentration in Chicago's West and South sides, where asthma disparities are well documented.<sup>4</sup>

Once enrolled, Medicaid claims data from the previous twelve months were used to determine risk level. Patients were defined as low-risk if they had no emergency department (ED) visits or hospitalizations, medium-risk patients had 1-3 ED visits or one hospitalization, and high-risk patients had more than 3 ED visits or more than one hospitalization in the past 12 months. The risk stratification determined the amount of services CHECK patients were initially eligible to receive.<sup>5</sup> Out of the 17,906 total patients enrolled, 11,381 had a diagnosis of asthma (Table 1). The asthma cohort was risk stratified as 620 in high risk (5.7%), 6,064 in medium risk (53.3%) and 4,697 (41.3%) low risk (Table). Patients with an asthma diagnosis were from birth to 26 years, with the majority being children and adolescents and nearly equal representation of females and males.

CHECK provided multiple interventions that spanned different levels of care. This care coordination model is built around CHWs.<sup>6-7</sup> CHWs were placed within a multi-disciplinary team that included physicians (general pediatricians and subspecialists), mental health workers, legal specialists, and care coordination management.<sup>8</sup> The main role of the CHWs was to implement individualized care coordination plans that address the patient and family needs identified in the assessments. Asthma training for the CHWs was conducted by an allergist-immunologist over two-days. The training consisted of a standard protocol covering asthma basics and CHW skills, delivered using popular education methods. Ongoing education and support was provided in various ways, including monthly clinical rounds with care coordinators, physicians, mental health workers, and the legal team.<sup>8</sup>

Because children spend a large portion of their time in schools, CHECK also offered asthma support to the Chicago Public Schools (CPS). This included in-service training and support of the CPS nurses. An in-person session provided by the CHECK Asthma Medical Director was provided as an introductory course to the entire district of school nurses in 2016 and 2017. A work group was formed consisting of the CPS nursing coordinators and CHECK physician leadership. This work group continues to meet monthly to determine ways to improve asthma management in schools. Reports of school absenteeism obtained through a data use agreement between CHECK and CPS were used to identify high-risk patients and focus services on high-need schools.

Establishing strong community partnerships with clinics was one of the most critical aspects of the CHECK program. The goal was to improve communication and effective patient transitions between EDs, hospitals, clinics, and homes. Specific provider-level education for clinical partners is ongoing in order to continue navigating barriers to accessing care, providing

guideline-based care in the community, and addressing the diagnosis of asthma in preschool children. One federally qualified health center requested we consult with their physicians and team about improving their adherence to the asthma clinical guidelines. We created a summary of recommendations, which have been implemented. Preliminary analyses of repeated chart reviews demonstrated improvements in severity and control documentation, addition of asthma to the medical history and problem list, and improved prescription of inhaled steroids and spacers.

Another way CHECK targets asthma is through use of the Asthma Control test (ACT). Following ACT scores in clinical practice has been linked with improved clinical outcomes, especially when linked with subspecialty care clinic.<sup>10</sup> A subset of CHWs with specific interest in asthma helped institute an ACT protocol where low ACT scores automatically qualified patients for a more intense protocol. In this protocol, an asthma CHW was assigned to conduct an asthma assessment with intensive follow-up that included an in-home environmental checklist. To date, ACT scores are available for 2,335 patients. An uncontrolled ACT with a score  $\leq 20$  was found in 564 (24.2%) of youth with asthma; this includes 226 with ACT scores  $< 15$ . When comparing patients with uncontrolled ACT scores to risk stratification through Medicaid claims data, 6.7% were high risk, 57.1% were medium risk, and 36.2% were low risk per claims data. These data show that many of those categorized as low risk by claims data are uncontrolled when looking at clinical symptoms.

CHECK is an example of a multi-level care coordination program that partners with schools and communities to improve asthma care management services for children and young adults in Chicago. We found that risk stratification using claims data among youth with asthma may not correlate with ACT scores. Although CHWs are in the field providing asthma services,

many questions still remain regarding their needs for training, supervision, and integration into the medical team. Critical evaluation of CHECK's care coordination model is ongoing to better assess the ability of these services to improve clinical outcomes, cost, and school absenteeism. We anticipate that further evaluation will translate into improved patient access and outcomes, reduced overall healthcare spending, and improved school attendance. Multi-level interventions like CHECK that address asthma management in a comprehensive way are essential to helping reduce disparities and improving asthma outcomes in children and young adults.

**Disclosures of Interest:** Dr. Pappalardo has worked with Boehringer-Ingelheim on their Speaker's Bureau and in consultation in the past, starting in 2016 and ending August 2017. While working in private practice August 2014 through July 2017, Dr. Pappalardo met with various pharmaceutical representatives representing different companies during the lunch period where lunch was provided to the staff at the private practice allergy clinic where she was an employee. These disclosures do not influence the work presented here. The other authors report no significant disclosures.

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**Table 1: CHECK Cohort Demographics and Asthma**

|                                                      | Asthma<br>Diagnosis<br>n=11,381 | Risk Category       |                       |                   | ACT <20 <sup>b</sup><br>n=564 | ACT ≥20 <sup>b</sup><br>n=1771 |
|------------------------------------------------------|---------------------------------|---------------------|-----------------------|-------------------|-------------------------------|--------------------------------|
|                                                      |                                 | High Risk<br>n=4697 | Medium Risk<br>n=6064 | Low Risk<br>n=620 |                               |                                |
| Age                                                  |                                 |                     |                       |                   |                               |                                |
| Infant (<12 months)                                  | 28 (0.2%)                       | 4 (0.1%)            | 23 (0.4%)             | 1 (0.2%)          | 0 (0%)                        | 0 (0%)                         |
| Children (1-11 yrs)                                  | 5361 (47.1%)                    | 2054 (43.7%)        | 3008 (49.6%)          | 299 (48.2%)       | 257 (45.6%)                   | 756 (42.7%)                    |
| Adolescent (12-18 yrs)                               | 3704 (32.5%)                    | 1831 (39.0%)        | 1767 (29.1%)          | 106 (17.1%)       | 171 (30.3%)                   | 689 (38.9%)                    |
| Young Adult (19-24yrs)                               | 1747 (15.4%)                    | 677 (14.4%)         | 935 (15.4%)           | 135 (21.8%)       | 100 (17.7%)                   | 278 (15.7%)                    |
| Adult (25 and older)                                 | 541 (4.8%)                      | 131 (2.8%)          | 331 (5.5%)            | 79 (12.7%)        | 36 (6.4%)                     | 48 (2.7%)                      |
| Gender                                               |                                 |                     |                       |                   |                               |                                |
| Female                                               | 5313 (46.7%)                    | 2076 (44.2%)        | 2894 (47.7%)          | 343 (55.3%)       | 291 (51.6%)                   | 791 (44.7%)                    |
| Male                                                 | 6068 (53.3%)                    | 2621 (55.8%)        | 3170 (52.3%)          | 277(44.7%)        | 273 (48.4%)                   | 980 (55.3%)                    |
| Race/Ethnicity                                       |                                 |                     |                       |                   |                               |                                |
| Asian                                                | 32 (0.3%)                       | 16 (0.3%)           | 13 (0.2%)             | 3 (0.5%)          | 3 (0.5%)                      | 13 (0.7%)                      |
| Black                                                | 1903 (16.7%)                    | 831 (17.7%)         | 988 (16.3%)           | 84 (13.5%)        | 367 (65.1%)                   | 854 (48.2%)                    |
| Hispanic                                             | 1006 (8.8%)                     | 490 (10.4%)         | 475 (7.8%)            | 41 (6.6%)         | 89 (15.8%)                    | 500 (28.2%)                    |
| Multi-Race                                           | 362 (3.2%)                      | 155 (3.3%)          | 189 (3.1%)            | 18 (2.9%)         | 43 (7.6%)                     | 196 (11.1%)                    |
| Other                                                | 2 (0.0%)                        | 1 (0.0%)            | 1 (0.0%)              | 0 (0.0%)          | 0 (0%)                        | 1 (0.1%)                       |
| Unknown                                              | 7961 (69.9%)                    | 3172 (67.5%)        | 4324 (71.3%)          | 465 (75.0%)       | 47 (8.3%)                     | 167 (9.4%)                     |
| White                                                | 115 (1.0%)                      | 32 (0.7%)           | 74 (1.2%)             | 9 (1.5%)          | 15 (2.7%)                     | 40 (2.3%)                      |
| Parent Education Level <sup>a</sup>                  | n=2933                          | n=1351              | n=1448                | n=134             | n=456                         | n=1437                         |
| Less than high school                                | 643 (21.9%)                     | 298 (22.1%)         | 319 (22.0%)           | 26 (19.4%)        | 0 (0%)                        | 0 (0%)                         |
| High school graduate                                 | 1017 (34.7%)                    | 487 (36.0%)         | 480 (33.1%)           | 50 (37.3%)        | 161 (35.3%)                   | 469 (32.6%)                    |
| Some college or trade school                         | 934 (31.8%)                     | 416 (30.8%)         | 473 (32.7%)           | 45 (33.6%)        | 0 (0%)                        | 0 (0%)                         |
| College Graduate                                     | 290 (9.9%)                      | 135 (10.0%)         | 146 (10.1%)           | 9 (6.7%)          | 37 (8.1%)                     | 151 (10.5%)                    |
| Other                                                | 49 (1.7%)                       | 15 (1.1%)           | 30 (2.1%)             | 4 (3.0%)          | 8 (1.8%)                      | 27 (1.9%)                      |
| General Health <sup>a</sup>                          | n=3229                          | n=1454              | n=1611                | n=164             | n=518                         | n=1557                         |
| Excellent                                            | 832 (25.8%)                     | 408 (28.1%)         | 390 (24.2%)           | 34 (20.7%)        | 63 (12.2%)                    | 444 (28.5%)                    |
| Very Good                                            | 807 (25.0%)                     | 371 (25.5%)         | 406 (25.2%)           | 30 (18.3%)        | 82 (15.8%)                    | 415 (26.7%)                    |
| Good                                                 | 1099 (34.0%)                    | 484 (33.3%)         | 553 (34.3%)           | 62 (37.8%)        | 215 (41.5%)                   | 510 (32.8%)                    |
| Fair                                                 | 435 (13.5%)                     | 170 (11.7%)         | 234 (14.5%)           | 31 (18.9%)        | 126 (24.3%)                   | 173 (11.1%)                    |
| Poor                                                 | 56 (1.7%)                       | 21 (1.4%)           | 28 (1.7%)             | 7 (4.3%)          | 32 (6.2%)                     | 15 (1.0%)                      |
| School Attendance in 2016, median (IQR) <sup>c</sup> | n=2772                          | n=1474              | n=1223                | n=75              |                               |                                |
|                                                      | 94.3% (8.2)                     | 95.1% (7.2%)        | 93.5% (8.9%)          | 91.1%(13.6%)      | Not available                 | Not available                  |

<sup>a</sup>Information on self-reported Parent Educational Level and General Health of the child were only available for those patients who are engaged.

<sup>b</sup>Patients with medium to high initial risk scores were preferentially targeted for ACT assessment.

<sup>c</sup>School Attendance Data is only available for those patients enrolled in Chicago Public Schools (CPS).