
Evaluating Inpatient Asthma Management Practices in Florida Hospitals

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ABSTRACT

We evaluated inpatient asthma management practices in 10 Florida hospitals. We wanted to learn about care protocols, instrumental resources, and use of evidence-based guidelines. We sought to recommend strategies for improving care based on gaps identified by this study. We developed a survey that included detailed questions on care strategies and resources. Guidelines from the National Heart, Lung, and Blood Institute (NHLBI) in the Expert Panel Report 3 (EPR-3) for the Diagnosis and Management of Asthma were a primary focus. Hospitals were given the option of completing their surveys by phone or email. Data were analyzed via content coding of completed surveys. Most participating hospitals had robust protocols and resources in place for inpatient asthma management, and continually reassessed these resources for quality improvement. Overall, inpatient care practices at these hospitals adhered strongly to national guidelines for asthma management. Inpatient asthma care practices at surveyed Florida hospitals are largely robust, evidence-based, and constantly improving. Our findings suggest not only that hospitals in Florida are deeply committed to effective asthma management, but also that they have active interest in collaborating with one another to further improve care.

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BACKGROUND

Direct and indirect costs related to asthma in the United States totaled approximately \$56 billion annually from 2002 to 2007 (Dudley, 2012; Barnett & Nurmagambetov, 2011). Yet, asthma prevalence and care costs continue to rise in many states, including Florida (Dudley, 2012). Asthma exerts major impacts on health-related quality of life (Adams et al., 2001), which also contributes to the societal costs of asthma. Investment in preventive care may reduce these costs (Grumbach & Grundy, 2010). Yet, despite efforts to improve primary care, asthma prevalence and costs continue to rise in many states, including Florida (Dudley, 2012). These factors suggest that improving asthma management is crucial for Florida and other states.

Many inpatient hospital stays can be avoided with proper asthma management (Lieu et al., 1997). Yet, in 2010, a total of 30,910 inpatient hospitalizations occurred in Florida with asthma listed as the primary diagnosis; an increase of 8.1% since 2005 (Dudley, 2012). The total annual charges associated with these visits increased by more than half between 2005 and 2010, rising to \$748.5 million. A collaborative team from Florida thus developed an evaluation project to

increase knowledge of current practices and illuminate gaps in preventive strategies.

In spring 2012, the Florida Asthma Program (FAP) at the Florida Department of Health collaborated with evaluators from the Florida State University College of Medicine (FSU), the Florida Asthma Coalition (FAC), and professionals from the Florida Hospital Association (FHA) to assess asthma management practices in select Florida hospitals. The team developed a qualitative survey that explored quality assurance efforts and performance improvement initiatives within inpatient units. This instrument focused on compliance with the National Heart, Lung, and Blood Institute's Expert Panel Report 3, Guidelines on the Diagnosis and Management of Asthma (EPR-3 guidelines).

We concluded our study by developing recommendations for further improvement of inpatient asthma management. These recommendations have since informed collaborative efforts to enhance asthma management within and around Florida hospitals. Specific strategies thus far have included developing interactive webinars for hospital professionals and

building partnerships between hospitals and community organizations.

We reviewed literature addressing two key areas captured by our survey instrument: inpatient asthma care practices, and performance improvement and quality assurance efforts in inpatient settings. Our search captured studies focusing on Florida specifically, the United States, and other countries for comparative purposes.

Overall, our review found strong and consistent evidence to suggest that four types of resources can substantially improve asthma management in hospital settings: educational programs for both patients and providers; clinical strategies delineating scenario-specific best practices; efforts to establish continuity of care post-discharge; and national guidelines as foundations for programs, strategies, and continuity efforts in asthma care. We noted strong similarities with the literature on emergency department (ED) care.

Evidence suggests that incorporating patient education into the care process significantly improves inpatient asthma management. People with asthma are less likely to be readmitted to the hospital if they receive individualized education as an inpatient (George et al., 1999). Improvements in asthma care documented by the studies we reviewed were generally similar for inpatient and ED units, as well as associated outpatient follow-up programs, and remained relatively consistent across age and sex groups. Ethno-racial disparities in quality of inpatient care may be reduced by patient education (George et al., 1999; Ebbinghaus & Bahrainwala, 2003). Study populations with different levels of education and income exhibited modest variation in the type and quality of inpatient care they received.

Interdisciplinary teams comprised of respiratory physicians and nurses appear to be particularly effective in providing education that improves patient outcomes and reduces readmissions post-discharge (Ebbinghaus & Bahrainwala, 2003; Kallenbach et al., 2003; Borgmeyer, Jamerson & Henry, 2008). Multifaceted provider education can improve care for both children and adults with asthma (Kallenbach et al., 2003; Mayo et al. 1996). Pediatric nurse practitioners (PNPs) could exert a significant positive impact on asthma care for children through provider education activities (Borgmeyer, Jamerson & Henry, 2008). As formal clinical strategies for inpatient asthma management are implemented, hospitals benefit from educating providers about monitoring adherence to the guidelines (Legoretta et al., 1998; Finkelstein et al., 2000).

Evaluation of clinical strategies reveals substantial promise for improving the costs of inpatient asthma

care, with respect to both length of stay and severity of symptoms (Johnson et al., 2000; Wazeka et al., 2001). Treating people with asthma in specialized wards (Bucknall et al., 1988) and/or increasing treatment intensity (Pirie et al., 1998) appears to improve outcomes (Corren et al., 2004; Nester et al., 1998). Based on national guidelines and population characteristics (Hartert et al., 2000), patient education materials should include information on appropriate use of medications (Haltermann et al., 2000). These materials must also use language appropriate to the health literacy level of patients (Rosas-Salazar et al., 2012). Non-adherence to EPR-3 recommendations can depress quality of care in both inpatient units and ED (George et al., 1999; Bucknall et al., 1988; Weinstein, 2011). Strategies delineating comprehensive home follow-up strategies for patients after discharge have shown particular success with controlling symptoms and reducing readmissions (Lieu et al., 1997).

Electronic medical records have also shown considerable promise for improving quality of both classification and pharmaceutical treatment of asthma in clinical care settings. Well-designed, fully implemented EMRs can facilitate impactful use of the EPR-3 guidelines in hospital settings (Davis et al., 2010). Unfortunately, poor adherence to prescribed medications can often undermine the success of guideline-recommended treatment strategies (David, 2004). Subsequently, hospitals have focused on medication adherence resources as a means of improving quality (Buston & Wood, 2000). To achieve these objectives, many hospitals have relied on provider education programs (Cabana et al., 2006), as well as efforts targeted to patients (Gibson, 2002). Hospitals may also benefit from educating providers about adherence to the guidelines, as implementation remains inconsistent (Legoretta et al., 1998; Finkelstein et al., 2000).

Regional disparities currently exist in hospitalization rates (Homa, Mannino, & Redd, 2002) as well as quality of inpatient care (Homer et al., 1996). Preliminary evidence from Florida-based case studies suggests that clinical strategies incorporating EPR-3 recommendations can dramatically reduce length of stay (Edwards & Fox, 2008). For asthmatic children enrolled in Florida Medicaid specifically, the EPR-3 guidelines appear to make a substantial positive difference across multiple domains of care (David, 2004; Morse et al., 2011).

Home follow-up visits have revealed that outcomes significantly improve when medication adherence programs are implemented for asthmatic children enrolled in Medicaid (Camargo et al., 2007). Additionally, efforts to improve care for asthmatic

Medicaid patients in Florida have also focused on specific comorbidities and unique service needs (Lubell, 2005). However, these strategies may not significantly impact rates of education, appropriate drug therapy, or readmission (Edwards & Fox, 2008). Most of the Florida case studies related to clinical care strategies have focused on children; adult Floridians may or may not benefit substantially from these strategies.

Data Sources

The 20 hospitals with the largest number of combined hospitalizations and ED visits in Florida with asthma listed as the primary diagnosis (ICD-9 code 493) in 2010 were selected for participation using the Florida Agency for Health Care Administration's discharge files. The FHA reviewed the list and provided contact information for several key informants at each hospital. FHA partners then made initial contact with each hospital in mid-June 2012, informing key personnel about the upcoming survey and encouraging participation when contacted by FSU evaluators.

The following week, FSU evaluators conducted recruitment by contacting the key personnel in each of the 20 hospitals in the sample, with the aim of enrolling 10 or more to complete the survey. Hospital personnel were given the option of either setting up a telephone interview with an FSU evaluator, or completing the survey instrument themselves and returning it via email. A minimum of four follow-up contacts by telephone or email was employed to recruit hospital participants. Data collection was concluded in October 2012.

A total of 10 hospitals completed the survey: three scheduled interviews and seven opted to complete the survey on their own. The responding hospitals had a combined total of 19,375 IP and ED visits with a primary diagnosis of asthma, accounting for 15.9% of Florida's 121,680 asthma-related hospital visits in 2010. The responding hospitals had a higher proportion of child asthma visits (72%) than adult asthma visits (27.9%). Table 1 displays the combined number of IP and ED encounters by age category among the 20 hospitals in the sampling frame.

METHODS

FSU evaluators worked with Florida Asthma Program staff, FHA partners, and members of the FAC's Clinical Workgroup to develop a key informant interview script to guide participating hospital representatives through the survey. The survey covered five topics altogether; in this paper we focus on results from the questions about inpatient care.

These questions assessed establishment and maintenance of formal inpatient asthma care protocols, specific practices and resources related to these protocols, and compliance of key documents and activities with EPR-3 guidelines. Most questions were open-ended, with no limit on participant response length or time. Participants could begin by indicating whether or not they were doing a given activity, then elaborate on its implementation at their particular hospital. Compliance with guidelines was assessed by asking hospital personnel if their inpatient units were uniformly conducting each of the four EPR-3 recommended activities. Responses to these questions (four total) followed a Yes/No format exclusively.

Interviews lasted between 15 and 30 minutes; self-completing hospitals generally returned their survey with responses within three days of receipt. Some respondents reported noteworthy effort to obtain requested information prior to the interview or self-completing the survey. All hospitals responding to the inpatient portion of the survey submitted complete data (all questions answered fully) for this section.

Written responses and interview transcripts were reviewed and coded by evaluators at the FSU College of Medicine. For open-ended questions about specific practices and improvement efforts, we first tabulated overall frequencies of doing or not doing particular activities. We then analyzed in-depth responses using open content coding to clarify common themes. We also tabulated frequencies of "Yes" and "No" responses for closed-ended questions, such as those assessing EPR-3 guideline compliance.

We now describe successes Florida hospitals have achieved in caring for patients with asthma, including EPR-3 guideline compliance. We also describe challenges that these hospitals continue to face. All results are reported in aggregate to protect confidentiality for participating hospitals. Our study was approved by the Florida State University Human Subjects Committee in spring 2012.

RESULTS

Nine out of 10 participating hospitals answered questions about inpatient asthma management. The respondent for the remaining hospital did not feel knowledgeable about inpatient protocols and therefore only answered questions about emergency department asthma management. Protocols for inpatient asthma management were generally found to be robust. Of the nine hospitals that answered these questions, six reported having asthma management protocols already in place for the inpatient setting; the remaining three indicated that protocols were currently being developed.

Several hospitals reported using the EPR-3 standards for guidance in developing their inpatient asthma care documents. All six hospitals with inpatient asthma management protocols already in place reported using patient chart auditing to monitor compliance with protocols. In addition, one hospital reported using case managers to follow up with patients post-discharge. Specific hospital procedures for tracking and following up with patients generally varied according to chosen sources of asthma management guidelines. Two of the three hospitals that did not report having asthma management protocols already in place cited physician orders as their primary source of guidance.

Adherence to national EPR-3 guidelines was complete or near-complete for inpatient units at all participating hospitals. All nine responding hospitals reported conducting asthma education activities with their inpatients. Eight hospitals reported and completed specific questions about education topics; covering inhaler technique, review of medications and when to take them, environmental control measures, and medical follow-up. Most hospitals also gave patients literature (brochures, etc.) to take home after discharge.

Seven out of nine responding hospitals reported sending patients home with a written Asthma Action Plan. Some hospitals call this a Home Management Plan of Care (HMPC). In most cases, hospital personnel reported that these HMPC documents contained equivalent content to Asthma Action Plan templates they had previously seen. All nine responding hospitals reported prescribing controller medications, such as inhaled corticosteroids upon discharge for patients with a history of persistent asthma. Whereas this practice was uniform across responding hospitals, decisions about whether or not to prescribe controller or reliever medications were made on a case-by-case basis following chart review and interviews to determine the extent of the patient's asthma history.

All six hospitals with inpatient protocols reported following up with primary care and/or respiratory physicians to ensure that patients received continuing care after discharge. Five of these six hospitals did the follow up themselves, generally within three days of discharge. The sixth provided patients with specific instructions about following up with community physicians. In addition, of the three hospitals without inpatient protocols, two engaged in similar activity, despite not having formal asthma care protocols in place. Mechanisms for communicating with physicians varied amongst hospitals: some used case managers, while others used nurses or respiratory therapists (RTs)

to complete these tasks. Standard guidance on communication techniques is not currently provided by the EPR-3 guidelines, which may explain some variability.

All nine responding hospitals reported making referrals to case management and/or other community resources. Most hospitals had case managers on staff specifically for the inpatient unit, but those that did not used centralized case management resources available on site. All nine responding hospitals either currently employ Certified Asthma Educators, or plan to employ them in the future.

All nine responding hospitals reported that they did not dispense inhalers for home use. Instead, patients at all of the responding hospitals were given prescriptions to fill at a pharmacy. All nine hospitals that responded to the inpatient questions reported using metered dose inhalers (MDIs) with holding chambers ("spacers") to dispense reliever medication during inpatient stays. These same hospitals incorporated content on using medications and delivery systems into education sessions, usually by having a nurse or RT work with the patient. All but one of these hospitals reported allowing patients to take home their holding chambers for personal use after discharge.

All 10 participating hospitals answered the questions about performance and quality. Seven of these hospitals reported currently conducting a comprehensive Performance Improvement/Quality Assurance (PI/QA) process that includes asthma management. The remaining three hospitals did not currently have a PI/QA process underway. Of the seven hospitals currently conducting PI/QA efforts, five reported using the Joint Commission CAC measures as guidance. The two others reported working from their own HMPC (similar to Asthma Action Plans as previously noted) for guidance on data tracking and reporting.

For the six hospitals that already had formal asthma care protocols, revisions were usually quite recent. All hospitals reported having revised their protocols within the last six months, and some were in the process of revising their protocols at the time of the interview or survey response. All of these hospitals reported updating their protocols at least once per year.

Six hospitals reported actively tracking inpatient readmissions. Five of these hospitals tracked repeat visits by specific patients: one tracked aggregate and inpatient admission rates over time. Seven of the 10 participating hospitals were unaware of how their hospital compared to others in the state with respect to asthma management quality and performance indicators. Of the remaining three, one cited National Association of Children's Hospitals and Related

Institutes (NACHRI) as the source for this information, and two others cited their own efforts to gather and review statistics from other hospitals.

Data tracking was found to be fairly uniform across hospitals for written care plans and patient education—only two participating hospitals reported not tracking education benchmarks from the EPR-3 guidelines. Seven of 10 participating hospitals reported actively reaching out to community providers and other partners to improve asthma care systems as well as practices within the hospital. Six hospitals specifically reported participating in the NACHRI children’s asthma care core measures project. Two of the other hospitals reported not participating despite being eligible. The remaining two hospitals were not eligible because they were not children’s hospitals. One hospital reported tracking missed work and school days for patients. Another hospital reported developing a checklist for use by both hospitals and private practitioners who see patients in the hospital, to ensure compliance with institutional protocols and EPR-3 guidelines.

DISCUSSION

The 10 hospitals that participated in this survey are performing relatively well in the area of inpatient asthma management. Specific strong points of participating hospitals’ performance include EPR-3 guideline adherence, community partnership building, and continuous quality improvement. Likewise, we noted potential opportunities for statewide hospital asthma care improvement efforts based on these notable strengths.

Inpatient care personnel at these Florida hospitals consistently implement recommendations from the EPR-3 guidelines and review their practices regularly. They use national evidence-based guidelines as appropriate and meet EPR-3 criteria to a robust degree. Evidence from the literature suggests that strengthening adherence to EPR-3 guidelines across all measures can further improve asthma care in Florida. Consequently, participating hospitals’ work can serve as a model for other health care facilities in Florida that are attempting to improve their inpatient asthma care practices and resources.

Most of these 10 hospitals are also working to engage community healthcare providers and other partners in collaborative efforts to improve asthma management for residents of their catchment areas. We found strong evidence of community partnership-building efforts within each hospital’s catchment communities. However, we found much less evidence of partnership-building across communities—few hospitals reported maintaining active dialogue with

facilities in other parts of Florida about asthma care and related quality improvement efforts. We thus targeted this untapped networking potential as a key priority for follow-up activities based on study results.

The surveyed hospitals are making efforts to improve their inpatient asthma care protocols. Hospitals are also working to improve patient follow-up procedures at hospitals where post-discharge protocols are less developed compared to those for inpatient settings. Surveyed hospitals also appear to recognize the value of training and hiring Certified Asthma Educators to supervise patient education. Incorporating certified educators in formal care protocols represents a recent advancement at several of our participating hospitals. Yet as noted above, hospitals are largely unaware at this time of how their performance measures and quality improvement efforts compare to those of other hospitals in the state.

The key shortcoming of inpatient procedures for asthma management in Florida appears to be lack of a process for dispensing of reliever and controller medications, along with the valved holding chambers at the time of discharge. At the time of data collection, Florida law stipulated that patients could not take leftover medications home from the hospital, but hospitals with onsite pharmacies could dispense new supplies for home use. However, in February 2014 the Florida Board of Pharmacy adopted a rule change addressing these restrictions (Lubell, 2005). This particular barrier to effective post-discharge asthma management may thus diminish in future years.

We endeavored to keep interview duration below 30 minutes. As a result, many areas of interest had to be excluded. The nature of the questions limited the amount of open-ended responses that were collected—many questions required a simple “yes” or “no,” although participants sometimes elaborated on these responses. Even with open-ended questions, we did not probe for case-specific nuances of identified practices or resources. For example we did not ask how implementation of protocols may have varied from patient to patient.

Because of the specific sampling methodology used, we did not categorize hospitals according to either asthma prevalence in their county or their market share of asthma patients in those communities. We also did not adjust utilization rates by size of catchment area. Finally, we did not stratify our sample based on specific service populations. However, we did know that some hospitals mostly served children and others served mostly adults.

Although Florida has 306 hospitals overall (Florida Hospital Association, 2014), our sampling frame contained only 20 hospitals, 10 of which we

interviewed. Although these hospitals spanned a mixture of child and adult target populations, we did not attempt to establish a representative case mix. We also did not account during sampling for whether hospitals operated on a for-profit or not-for-profit basis. This may have exerted some impact on observed patterns of asthma management among the 10 hospitals we interviewed.

Likewise, response bias may have impacted the patterns we observed. Hospitals with robust policies and procedures already in place may have shown more interest in responding to the survey than those still

facing greater challenges. Results from this study may thus reflect patterns of care at hospitals with more sophisticated asthma care protocols and/or more consistent implementation of EPR-3 recommendations.

Our small sample size of hospitals may have limited our ability to generalize results to the full range of hospitals within Florida, but restricting sample size also allowed us to collect detailed information from each hospital we interviewed. Interviewing staff from hospitals with the highest rates of asthma catchment also allowed us to identify and address gaps that can translate into high-impact interventions for Floridians.

Table 1. Total Number of ED and IP Discharges with a Primary Diagnosis of Asthma for Adults and Children in the 20 Hospital Sampling Frame, Florida 2010

Facility Rank	Total ED and IP Discharges with Primary Diagnosis of Asthma	Child (0-17) Primary Asthma Discharges	Adult (18+) Primary Asthma Discharges	Completed Survey
1	3770	2889	881	Yes
2	3040	1607	1433	No
3	2902	1595	1307	No
4	2618	1732	886	Yes
5	2293	2268	25	No
6	2160	950	1210	No
7	1985	1072	913	Yes
8	1935	1151	784	No
9	1780	1768	12	Yes
10	1729	432	1297	No
11	1662	1006	656	No
12	1647	1610	37	Yes
13	1643	1198	445	Yes
14	1603	1056	547	No
15	1555	595	960	Yes
16	1523	1249	274	Yes
17	1508	730	778	No
18	1465	972	493	Yes
19	1462	800	662	No
20	1389	886	503	Yes

Table 2. Inpatient Asthma Care Practices

Activity	Percent of Hospitals Doing This
Existing formal asthma care protocols for inpatients	67%
Developing formal protocols	33%
Patient chart auditing	67%
Case managers for post-discharge follow-up	11%
Asthma education (per EPR-3 recommendations)	100%
Sending people home with written plans	78%
Following up with primary care providers	89%
Making referrals to case management	100%
Employing Certified Asthma Educators	100%
Dispensing inhalers for home use	0%
Using MDIs with spacers	100%
Allowing people to take spacers home	89%

Table 3. Performance Improvement and Quality Assurance Efforts

Activity	Percent of Hospitals Doing This
Comprehensive PI/QA process	70%
Using Joint Commission CAC measures	50%
Working from own plans of care to do PI/QA	20%
Revised formal care protocols within last six months	60%
Tracking inpatient readmissions	60%
Tracking repeat visits by specific patients	50%
Aware of how hospital compares to others in FL	30%
Tracking education benchmarks from EPR-3	90%
Tracking missed school/work days	10%
Developing compliance checklists	10%

Finally, we observed a high degree of saturation in responses to our survey, suggesting that interviewing additional hospitals might not have added substantial value.

Because our data were collected via self-report, we caution against interpreting our findings as comprehensively accurate in all cases. Rather, these results paint a broad picture of major strengths and gaps in inpatient asthma care at participating Florida hospitals. Accuracy and richness of data collection could be improved in future studies by querying medical records, reviewing written asthma care protocols, and/or conducting onsite observation.

Getting input from multiple people at many of the sampled hospitals contributed substantial diversity of perspective in data collection. Our within-hospital sampling strategy thus constituted a key strength of the study. Likewise, the perspectives of our evaluators constituted a check against potential inaccuracy in

describing EPR-3 compliance. Whereas data on potentially compliant activities were collected via self-report, compliance of said activities with the guidelines was assessed independently by the study team. This helped to limit potential bias from overconfidence on the part of participating hospitals.

Conclusions

Overall, our study of inpatient units within large Florida hospitals revealed that most participating hospitals are doing guideline-recommended activities and conducting internal evaluation of best practices for asthma care. However, inter-professional data sharing and collaborative activity between hospitals remain extremely limited even at those institutions most actively committed to continuous quality improvement. Our findings thus suggest that Floridians with asthma could benefit from increased communication and collaboration among hospitals.

EPR-3 guideline compliance represents a key priority area for future collaborative activity to improve inpatient asthma care. Whereas participating hospitals generally performed well on EPR-3 implementation, they were largely unaware of how other hospitals in the state compared on these quality measures and strategies used to address gaps. Team-based approaches could increase the overall knowledge base on inpatient asthma management in Florida, including best practices for translating national guidelines and measures into strategies for state-level impact. Synthesis of efforts between different hospitals could also promote both continuous quality improvement, and consistency in inpatient asthma care standards throughout the state.

Our project team has already experienced success with one such effort. Specifically, the FAC and FHA offered two complementary webinars in summer 2013 to address gaps in emergency department asthma management identified by our 2012 survey. Webinars focused on current problems and challenges with emergency department asthma management in Florida, offering data on the current landscape as well as promising solution strategies. Inter-professional team-building was a key emphasis of both webinars, each of which included success stories from hospitals that had effectively implemented collaborative strategies to reduce barriers to positive emergency asthma care processes and outcomes.

A variety of specially trained professionals, including Registered Respiratory Therapists and Certified Asthma Educators, participated in the development and delivery of these webinars. The webinars thus helped to build inter-professional capacity for continuous quality improvement and monitoring among different hospitals providing asthma care in Florida. We continue to engage these highly trained asthma care specialists in follow-up from our pilot webinars with emergency departments, including publication of evaluation results from the 2013 workshops. As the FAC expands its membership and scope of organizational partnerships, our team also hopes to engage the Association of Asthma Educators as a partner for future inter-professional education and training activities.

REFERENCES

Adams, R., Wakefield, M., Wilson, D., et al. (2001). Quality of life in asthma: a comparison of community and hospital asthma patients. *Journal of Asthma*, 38, 205-214.

Barnett, S.B., & Nurmagambetov, T.A. (2011). Costs of Asthma in the United States: 2002-2007. *Journal of Allergy and Clinical Immunology*, 127(1),

In the process of developing and implementing these webinars to address needs identified for emergency department care, the FAC and FHA were also able to create dialogue between hospitals about other types of asthma care improvement efforts, including those for inpatient units. The FAC and its numerous partner organizations continue to champion the benefits of hiring Certified Asthma Educators and Registered Respiratory Therapists, as well as implementing and maintaining fidelity to EPR-3 guidelines. Inpatient units that had just begun performance review and quality improvement for their asthma care protocols at the time of our study in 2012 are likely to have made great strides toward better outcomes.

We observed a general pattern in 2012 of hospitals increasing their quality assurance efforts in the area of inpatient asthma care. Likewise, statewide interest in collaborative care improvement planning appeared to increase as hospitals participated in follow-up activities from our original study. We thus feel optimistic that inpatient asthma care at Florida hospitals will continue to improve in the coming years, and that hospitals will engage more actively with one another in discussing lessons learned from their internal improvement processes.

Declaration of Interest

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145-152.

Borgmeyer, A., Gyr, P.M., Jamerson, P.A., & Henry, L.D. (2008). Evaluation of the role of the pediatric nurse practitioner in an inpatient asthma program. *Journal of Pediatric Health Care*, 22, 273-281.

Bucknall, C., Moran, F., Robertson, C., &

- Stevenson, R. (1988). Differences in hospital asthma management. *Lancet*, 331, 748-750.
- Buston, K.M., & Wood, S.F. (2000). Non-compliance amongst adolescents with asthma: listening to what they tell us about self-management. *Family Practice*, 17, 134-138.
- Cabana, M.D., Slish, K.K., Evans D., et al. (2006). Impact of physician asthma care education on patient outcomes. *Pediatrics*, 117, 2149-2157.
- Camargo, C.A., Ramachandran, S., Ryskina, K.L., Lewis, B.E., & Legorreta, A.P. (2007). Association between common asthma therapies and recurrent asthma exacerbations in children enrolled in a state Medicaid plan. *American Journal of Health System Pharmacy*, 64, 1054-1061.
- Corren, J., Manning, B.E., Thompson, S.F., Hennessy, S., & Strom, B.L. (2004). Rhinitis therapy and the prevention of hospital care for asthma: a case-control study. *Journal of Allergy and Clinical Immunology*, 113, 415-419.
- David, C. (2004). Preventive therapy for asthmatic children under Florida Medicaid: changes during the 1990s. *Journal of Asthma*, 41, 655-661.
- Davis, A.M., Cannon, M., Ables, A.Z., & Bendyk, H. (2010). Using the electronic medical record to improve asthma severity documentation and treatment among family medicine residents. *Family Medicine*, 42, 334-337.
- Ebbinghaus, S., & Bahrainwala A.H. (2003). Asthma management by an inpatient asthma care team. *Pediatric Nursing*, 29, 177-183.
- Edwards, E., & Fox, K. (2008). A retrospective study evaluating the effectiveness of an asthma clinical pathway in pediatric inpatient practice. *Journal of Pediatric Pharmacology and Therapeutics*, 13, 233-241.
- Finkelstein, J.A., Lozano, P., Shulruff, R., et al. (2000). Self-reported physician practices for children with asthma: are national guidelines followed? *Pediatrics*, 106, 886-896.
- Florida Hospital Association. (2012). *Facts and Stats about the Florida Hospital Association*. Updated June 8, 2012. Retrieved March 28, 2014 from: <http://www.fha.org/reports-and-resources/facts-and-stats.aspx>.
- Forrest, J. & Dudley, J. (2012). *Burden of Asthma in Florida*. Tallahassee, FL: Florida Department of Health, Division of Community Health Promotion, Bureau of Chronic Disease Prevention, Florida Asthma Program. Retrieved February 24, 2015 from <http://www.floridahealth.gov/diseases-and-conditions/asthma/documents/asthma-burden2013.pdf>.
- George, M.R., O'Dowd, L.C., Martin, I., et al. (1999). A comprehensive educational program improves clinical outcome measures in inner-city patients with asthma. *Archives of Internal Medicine*, 159, 1710-1716.
- Gibson P., Powell H., Coughlan J., et al. (2003). Self-management education and regular practitioner review for adults with asthma. *Cochrane Database of Systematic Reviews*. CD001117
- Grumbach, K. & Grundy, P. (2010). *Outcomes of Implementing Patient Centered Medical Home Interventions*. Washington, DC: Patient-Centered Primary Care Collaborative. Retrieved February 24, 2105 from <http://www.cms.org/uploads/GrumbachGrundy2010OutcomesPCPCC.pdf>.
- Halterman, J.S., Aligne, C.A., Auinger, P., McBride, J.T., & Szilagyi, P.G. (2000). Inadequate therapy for asthma among children in the United States. *Pediatrics*, 105, 272-276.
- Hartert, T., Toggias, A., Mellen, B., Mitchel, E., Snowden, M., & Griffin, M. (2000). Underutilization of controller and rescue medications among older adults with asthma requiring hospital care. *Journal of the American Geriatrics Society*, 48, 651-657.
- Homa, D.M., Mannino, D.M., & Redd, S.C. (2002). Regional differences in hospitalizations for asthma in the United States, 1988-1996. *Journal of Asthma*, 39, 449-455.
- Homer, C.J., Szilagyi, P., Rodewald, L., et al. (1996). Does quality of care affect rates of hospitalization for childhood asthma? *Pediatrics*, 98, 18-23.
- Johnson, K.B., Blaisdell, C.J., Walker, A., & Eggleston, P. (2000). Effectiveness of a clinical pathway for inpatient asthma management. *Pediatrics*, 106, 1006-1012.
- Kallenbach, A., Ludwig-Beymer, P., Welsh, C., Norris, J., & Giloth, B. (2003). Process improvement for asthma: an integrated approach. *Journal of Nursing Care Quality*, 18, 245-258.
- Legorreta, A.P., Christian-Herman, J., O'Connor, R.D., Hasan, M.M., Evans, R., & Leung, K-M. (1998). Compliance with national asthma management guidelines and specialty care: a health maintenance organization experience. *Archives of Internal Medicine*, 158, 457-464.
- Lieu, T.A., Quesenberry, C.P., Capra, A.M., Sorel, M.E., Martin, K.E., & Mendoza, GR. (1997). Outpatient management practices associated with reduced risk of pediatric asthma hospitalization and emergency department visits. *Pediatrics*, 100, 334-341.
- Lubell, J. (2005). Florida Medicaid to focus on care management. *Family Practice News*, 35, 90.
- Mayo, P.H., Weinberg, B.J., Kramer, B.,

Richman, J., Seibert-Choi, O-S., & Rosen, M.J. (1996). Results of a program to improve the process of inpatient care of adult asthmatics. *Chest*, *110*, 48-52.

Morse, R.B., Hall, M., Fieldston, E.S., et al. (2011). Hospital-level compliance with asthma care quality measures at children's hospitals and subsequent asthma-related outcomes. *JAMA*, *306*, 1454-1460.

Nestor, A., Calhoun, A.C., Dickson, M., & Kalik, C.A. (1998). Cross-sectional analysis of the relationship between national guideline recommended asthma drug therapy and emergency/hospital use within a managed care population. *Annals of Allergy, Asthma, & Immunology*, *81*, 327-330.

Pirie, J., Cox, P., Johnson, D., & Schuh, S. (1998). Changes in treatment and outcomes of children receiving care in the intensive care unit for severe acute asthma. *Pediatric Emergency Care*, *14*, 104-108.

Rosas-Salazar, C., Apter, A., Canino, G., & Celedón, J.C. (2012). Health literacy and asthma. *Journal Allergy and Clinical Immunology*, *129*, 935-942.

Wazeka, A., Valacer, D.J., Cooper, M., Caplan, D.W., & DiMaio, M. (2001). Impact of a pediatric asthma clinical pathway on hospital cost and length of stay. *Pediatric Pulmonology*, *32*, 211-216.

Weinstein A.G. (2011). The potential of asthma adherence management to enhance asthma guidelines. *Annals of Allergy, Asthma, & Immunology*, *106*, 283-291.

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