Best Fed Beginnings: A Nationwide Quality Improvement Initiative to Increase Breastfeeding

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BACKGROUND AND OBJECTIVE: In response to a low number of Baby-Friendly-designated hospitals in the United States, the Centers for Disease Control and Prevention funded the National Institute for Children’s Health Quality to conduct a national quality improvement initiative between 2011 and 2015. The initiative was entitled Best Fed Beginnings and enrolled 90 hospitals in a nationwide initiative to increase breastfeeding and achieve Baby-Friendly designation.

METHODS: The intervention period lasted from July 2012 to August 2014. During that period, data on process indicators aligned with the Ten Steps to Successful Breastfeeding and outcome measures (overall and exclusively related to breastfeeding) were collected. In addition, data on the Baby-Friendly designation were collected after the end of the intervention through April 2016. Hospitals assembled multidisciplinary teams that included parent partners and community representatives. Three in-person learning sessions were interspersed with remote learning and tests of change, and a Web-based platform housed resources and data for widespread sharing.

RESULTS: By April 2016, a total of 72 (80%) of the 90 hospitals received the Baby-Friendly designation, nearly doubling the number of designated hospitals in the United States. Participation in the Best Fed Beginnings initiative had significantly high correlation with designation compared with hospital applicants not in the program (Pearson’s r [235]: 0.80; P < .01). Overall breastfeeding increased from 79% to 83% (t = 1.93; P = .057), and exclusive breastfeeding increased from 39% to 61% (t = 9.72; P < .001).

CONCLUSIONS: A nationwide initiative of maternity care hospitals accomplished rapid transformative changes to achieve Baby-Friendly designation. These changes were accompanied by a significant increase in exclusive breastfeeding.

Breastfeeding is a powerful public health intervention that enhances the health outcomes of mothers, children, families, and society, as well as offering economic benefits. Despite progress in increasing breastfeeding rates in the United States, significant disparities and high rates of nonexclusive breastfeeding continue to exist. Low exclusive and overall breastfeeding rates were the catalyst for the US Surgeon General’s Call to Action to Support Breastfeeding in 2011, providing a template to bolster breastfeeding through improvements in maternity care

practices. Maternity care practices have been a major focus of attention because if a hospital implements the World Health Organization’s Ten Steps to Successful Breastfeeding, breastfeeding initiation, exclusivity, and duration increase, and these practices may reduce disparities in breastfeeding.

The Baby-Friendly Hospital Initiative (BFHI) began as a global effort to promote, protect, and support breastfeeding by implementation of the World Health Organization’s Ten Steps to Successful Breastfeeding (referred to as the “Ten Steps”) established in 1991. In the United States, Baby-Friendly designation is conferred by Baby-Friendly USA, a nonprofit entity working under the guidance of the World Health Organization. Designation as a Baby-Friendly facility in the United States involves 4 phases, referred to as the 4-D Pathway: discovery, development, dissemination, and designation. When hospitals are prepared, Baby-Friendly USA conducts a readiness assessment interview followed by an onsite assessment.

Despite rapid global adoption of the BFHI, hospitals in the United States were slow to adopt this initiative. In January 2011, a total of 100 US hospitals were designated as Baby-Friendly, affecting only 6.2% of the births in the United States.

The Centers for Disease Control and Prevention (CDC) selected the National Institute for Children’s Health Quality (NICHQ) to lead a national quality improvement (QI) collaborative project in October 2011. This initiative, Best Fed Beginnings (BFB), was specifically aimed to enable 90 hospitals to earn Baby-Friendly designation or have a Baby-Friendly USA assessment scheduled by the end of the collaborative project. The intervention targeted hospitals that served populations in which breastfeeding rates are historically below the national average, such as hospitals serving large African-American populations, and hospitals in the southeastern United States.

METHODS

Contextual Framework

The overarching framework for the BFB collaborative was based on the Institute for Healthcare Improvement’s Breakthrough Series, modified to meet the requirements and unique needs of the topic and context. The Breakthrough Series for BFB (Fig 1) began as improvement advisors and content experts gathered to refine the project aim and the key drivers for change. This approach resulted in the BFB Driver Diagram as the basis for a change package and adoption of the Ten Steps (Fig 2). The intervention period lasted from July 2012 to August 2014. During that period, detailed data on process indicators and outcomes were collected. In addition, data on the Baby-Friendly designation were collected after the end of the intervention in 2015 and 2016.

Given the size of this initiative, BFB was conducted as 3 simultaneous Breakthrough Series collaborative projects comprising hospitals from 3 geographic regions. Each region was assigned a regional faculty member who served primarily as content expert. The program was supported by the NICHQ project team and staff. In addition, the CDC funding supported a cooperative agreement with Baby-Friendly USA to provide remote and in-person learning, as well as online education for staff training requirements of the BFHI. Physician education was provided in face-to-face learning sessions through train-the-trainer programs, and remotely via webinars. Community collaboration was facilitated by a cooperative agreement between the CDC, NICHQ, and the US Breastfeeding Committee. This agreement aimed to strengthen prenatal and postpartum breastfeeding support outside the hospital, as required by Steps 3 (prenatal care) and 10 (discharge support).

Each hospital team was composed of a team leader, a lactation specialist, at least 1 physician champion, a maternal/child nurse champion, a representative from QI/performance improvement, a senior administrative leader, and a community representative such as a mother who had given birth at the hospital in the previous 3 years. Many hospitals included an ambulatory practice manager and personnel from departments such as public relations and marketing, staff education, graduate medical education, information technology and systems, and purchasing.

Hospital Selection

Hospitals applied via a competitive process. Selection criteria were based on the funding context and discussion between CDC, NICHQ, and content experts. Selection criteria included low breastfeeding rates, readiness for change, the establishment of a Baby-Friendly/breastfeeding steering committee/task force, sociodemographic characteristics of the populations served, geographic locations (with preference for regions with low breastfeeding rates and/or few Baby-Friendly-designated hospitals), commitment of senior leadership (Supplemental Table 2 includes selected hospitals, Supplemental Table 3 provides the application form details), and experience with QI tactics. The requirements for engagement of hospital leadership have been described elsewhere.

A self-assessment survey, modified based on the Baby-Friendly USA self-assessment tool, was developed to determine baseline information regarding the Ten Steps and...
Interventions

A summary of the curriculum and interventions is provided in Supplemental Table 4. Pre-work took place before the learning sessions and included an orientation for data collection, QI methods, and a detailed self-assessment. As the project progressed, teams tested improvements by using Plan-Do-Study-Act (PDSA) cycles linked to each of the Ten Steps; an example includes testing skin-to-skin care with 1 mother–infant dyad, 1 physician, and the staff team during 1 shift. The knowledge built through the design and testing of thousands of changes using PDSA cycles, coupled with ongoing interdisciplinary education and training, led to the development of reliable and standard care processes.

A Web-based platform, NICHQ’s Improvement Laboratory (ILab), housed resources and monthly improvement data for widespread sharing, as well as PDSA cycles submitted by hospitals. Teams were instructed to annotate their own run charts with the interventions that they tested to trace the impact that various interventions had on their data.

Teams were guided through the first 3 phases of the 4-D pathway, and at specific time points, all hospitals advanced to the next phase. All hospitals advanced into the final “designation” phase at the final learning session. NICHQ offered a mock assessment to hospitals after achieving the final activities of this last phase to prepare the hospital for Baby-Friendly USA’s actual assessment and to assess their data collection processes.

A series of Harvest Meetings were conducted in June 2014 for hospitals to share breakthroughs, challenges, and key lessons learned. Teams were coached through the end of March 2015, and designation status was monitored through April 2016.

Measures

The overall aim of the learning collaborative was for participating institutions to attain Baby Friendly designation. The measurement strategy (Supplemental Table 5) included process measures aligned with the Ten Steps and the
Outcome measures included rates of overall and exclusive breastfeeding among healthy term newborns at discharge according to hospital. Exclusive breastfeeding was defined as receiving only mother’s milk, no other food or fluid other than medications, either via direct breastfeeding or expressed breast milk, throughout the entire delivery hospital period. Overall breastfeeding was defined as receiving any breast milk from the mother during the hospital stay. Hospitals were given explicit guidance about the methods of data extraction from the medical record, sampling charts, data definitions, and how to enter numerators and denominators for process and outcomes measures. Teams were continuously guided to self-report these data on a monthly basis; reporting was voluntary. Hospitals reported 3 outcomes and 8 process measures each month (Supplemental Table 5). The operational definitions were provided to each participating team to standardize the reporting process. Each team identified a data manager who received training and support, and submitted data monthly. During the last few months of the initiative, hospitals moved to reporting the outcome measures monthly and the process measures quarterly to free up capacity for work leading up to the Baby-Friendly USA designation site visit. Hospitals were advised to collect and report data on a sample of 25% of their mother–infant dyads in the 1 month before their data submission month unless the volume was extremely high or low. In these cases, the following approach was used: if monthly census was >120 infants, submit maximum of 30 charts; if monthly census was <40 infants, submit minimum of 10 charts; and if monthly census was <10, use charts from the previous month to reach 10 infants.
Descriptive data on hospitals are reported with the denominator of 90 originally enrolled facilities. Descriptive data on hospital measures and breastfeeding rates are reported based on the 89 participating hospitals in the collaborative. Skin-to-skin care was reported separately for vaginal versus cesarean deliveries. Targets of 90% threshold were set as a readiness point for site assessment of 90% of participating hospitals.

### Data Analysis

Per the QI model, data reporting and analysis were for the purpose of improvement and not for accountability or research. The data reported were used to help understand processes, evaluate the impact of process changes, and support the content planning for learning sessions and action period interventions. Statistical process control p-charts and run charts were used to monitor changes in hospital implementation of the Ten Steps by using established rules for identifying special cause variation. We considered 8 consecutive points above or below the centerline and points outside the control limits to represent special cause variation, prompting a change in the centerline. Such observations happen <0.4% of the time by chance and are therefore conventionally accepted as suggesting statistically significant changes.

We also tested for significance at the $P < .05$ level for pre–post comparisons by using $\chi^2$ tests for categorical variables and $t$ tests for process measures, including rate of skin-to-skin care and outcome measures of overall and exclusive breastfeeding percentage rates as reported by hospitals. Pearson correlation was computed to compare the association of participation in BFB on the Baby-Friendly designation; logistic regression analysis of BFB was conducted to predict designation. Analyses were performed by using SPSS version 22.0. The BFB initiative and analysis described in the present article follow the SQUIRE 2.0 guidelines.

### Human Subjects Protection

This QI initiative was reviewed by the institutional review board at Cooper University Hospital and granted exempt status.

### RESULTS

Ninety hospitals of 235 applicants were selected; 1 hospital dropped out shortly after notification. Thus, 89 hospitals participated throughout the entire project period, eligible to report data during the intervention period, from July 2012 through August 2014, and followed through April 2016 to determine Baby-Friendly designation status. Sixty–two percent of the hospitals received on-site mock site assessments, and 6% received virtual mock assessments. By March 2015, a total of 31 (34%) of the 90 hospitals had received the Baby-Friendly designation and another 30 (33%) had completed an on-site Baby-Friendly assessment (Table 1). By April 2016, a total of 72 (80%) of the 90 hospitals became designated as Baby-Friendly, nearly doubling the number of such hospitals in the United States. Five hospitals withdrew from the Baby-Friendly pathway for reasons such as hospital merger, leadership and/or staff turnover, and refusal to purchase infant formula. The final account of hospitals designated, date of designation, and status through April of 2016 are presented in Table 1. Compared with hospital applicants not accepted into the program, participation in the BFB initiative had significantly high correlation with designation (Pearson’s $r$ [235]: 0.80; $P < .01$). Logistic regression revealed a significant correlation ($R^2 = 0.717$), with a predictive odds ratio of 141 ($P < .001$).

Although reporting was voluntary, 81% of hospitals reported on all measures throughout the project. Annotated project run charts are illustrated for skin-to-skin care after vaginal and cesarean deliveries (Fig 3) and for rooming-in for all hospitals (Fig 4). The project resulted in 31 facilities reaching the goal of 90% skin-to-skin care by July 2014, and the median proportion of infants born vaginally who were provided skin-to-skin care shifted from 18% to 65% ($t = 13.78; P < .001$). Outcome data are illustrated in run charts for overall breastfeeding (Fig 5) and exclusive breastfeeding (Fig 6). Overall breastfeeding increased from 79% to 83% ($t = 1.93; P = .057$), and exclusive breastfeeding from 39% to 61% ($t = 9.72; P < .001$). Among the 89 hospitals, 61% increased their overall breastfeeding.

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**TABLE 1** Pipeline of 90 BFB Hospitals as of End-of-Project March 2015 and Updated Progress as of April 2016

<table>
<thead>
<tr>
<th>Variable</th>
<th>July 2012</th>
<th>March 2015</th>
<th>April 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total N</td>
<td>90</td>
<td>89</td>
<td>89</td>
</tr>
<tr>
<td>Withdrawn/missing</td>
<td>0</td>
<td>1 (1)</td>
<td>6 (6.6)</td>
</tr>
<tr>
<td>Baby-Friendly USA D1 discovery phase</td>
<td>10 (11)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Baby-Friendly USA D4 designation phase</td>
<td>0</td>
<td>89 (99)</td>
<td>84 (93)</td>
</tr>
<tr>
<td>Conducted readiness assessment with Baby-Friendly USA</td>
<td>0</td>
<td>78 (87)</td>
<td>79 (88)</td>
</tr>
<tr>
<td>Completed on-site assessment</td>
<td>0</td>
<td>61 (68)</td>
<td>78 (87)</td>
</tr>
<tr>
<td>Baby-Friendly–designated hospitals</td>
<td>0</td>
<td>31 (34)</td>
<td>72 (80)</td>
</tr>
</tbody>
</table>

Data are presented as n (%) unless otherwise indicated.
rate. Trend analysis demonstrated high goodness-of-fit for hospital improvements in skin-to-skin vaginal delivery, skin-to-skin cesarean deliveries, rooming in, and exclusive breastfeeding rates ($R^2 = 0.92, 0.93, 0.95$, and $0.80$, respectively), and moderate goodness-of-fit for overall breastfeeding rates ($R^2 = 0.47$).

**DISCUSSION**

BFB successfully increased the number of US Baby-Friendly–designated hospitals. Although BFB did not reach 100% designation or site visit scheduled among the 89 hospitals that participated in the project, 80% of the hospitals achieved Baby-Friendly designation by April 2016, which affected an estimated 218,000 births annually. Many of these hospitals (48 [54%] of 89) were either academic or large birthing centers, with >2500 births per year and responsible for training the health care providers and leaders of the future. Although the total number of US hospitals designated as Baby-Friendly also increased throughout the project period (100 beginning in 2011, 170 by the end of 2013, and 245 by the end of 2015), hospitals involved in BFB were significantly more likely to achieve designation ($P < .01$).

Furthermore, participation in BFB resulted in a trend toward higher overall breastfeeding and significant increases in exclusive breastfeeding. Compared with national rates determined by the CDC in respective years, the baseline overall breastfeeding rate was similar at baseline (79% vs 79.2%) and slightly higher after the intervention (83% vs 81.1%). The selection of hospitals in areas with traditionally low breastfeeding rates was more apparent in the category of exclusive breastfeeding, as the rate at baseline was 39%, compared with the national rate of 64%, derived from the percent supplemented within 2 days subtracted from the overall rate of 79%. Although the national exclusive breastfeeding rate increased 3% to 67.3%, BFB hospitals’ exclusive breastfeeding increased 22% to 61% ($P < .001$). Improvement in exclusive breastfeeding initiation may be expected to have a greater impact on duration of breastfeeding because exclusive breastfeeding initiation is a strong indicator of continued breastfeeding practices.

Progress toward Baby-Friendly designation continued well after the intervention period ended, reflecting the possibility that the learning collaborative efforts were accompanied by improvements to the hospital infrastructure to support breastfeeding. These changes indicate sustainable progress toward improvements in maternity care practices.

There are limitations to interpreting results from QI collaborative interventions such as this one. Missing data were a common concern. Process measures that created the most challenge in reporting were rooming-in and assistance and support with
breastfeeding after mother–infant separation. Because data were collected and reported back solely for the purpose of improvement, these same limitations were used as learning opportunities. We learned that systems need to be put into place to help organizations capture data that reflect performance in process measures. All 89 hospitals reported breastfeeding outcome measures; however, the validity of these self-reported data were called into question due to some inconsistencies identified at the time of the site visits, despite being mandatory reporting requirements established by The Joint Commission. Hospital data were ultimately validated by Baby-Friendly USA for the 78 hospitals assessed. With the transition to electronic health records, many hospitals were in the midst of developing mechanisms to capture data on any breastfeeding and exclusive breastfeeding, as well as systematic and reliable methods of documenting breastfeeding support practices. Some of the participating hospitals were able to engage specialists in information technology to automate capture of process and outcome measures over the project period. These changes help future efforts in continuous QI to maintain designation as well as comply with mandatory reporting requirements.

Despite the fact that project teams were recruited based on the strength of their past QI research, we found wide variability in their understanding of improvement science and in the execution of PDSA cycles. One common observation was that project teams became caught in the “Do” phase, jumping from 1 task to the next, versus processing the changes with staff and learning from the test. Another observation was that project teams spearheading the local work had challenges carving out time to conduct tests of change due to staff turnover, leadership changes, and changing or competing priorities. It is expected that with more experience in applying QI methods, hospitals will be better positioned to engage in large-scale transformational changes.

Finally, because we collected data only from the inpatient setting, we were unable to identify if this initiative has an impact on the continuation of overall or exclusive breastfeeding. We expect that increased breastfeeding initiation would have a positive effect on follow-up rates of breastfeeding postdischarge. In addition, training of physicians in accordance with the BFHI is associated with increased duration of overall breastfeeding and exclusive breastfeeding.

The strength of this project was in the interinstitutional trust that was built in which all involved participated in learning and teaching. NICHQ has created a publicly accessible repository of resources for future projects focused on enhancements to maternity care practices and Baby-Friendly designation (http://breastfeeding.nichq.org/resources). Furthermore, because Baby-Friendly USA has...
adopted a sustainability plan that now mandates continuous QI, the BFB project has created a framework for measuring change and improving practices consistent with the Ten Steps. Finally, this project was the first nationwide use of systematic QI methods in breastfeeding, and these methods have since been increasingly used.31

As of April 2016, >16% of newborns in the United States are being born in Baby-Friendly–designated hospitals, compared with 6.2% in 2011.32 If exposure to the BFHI increases the likelihood of exclusive breastfeeding at the start and for a longer duration, associated health outcomes may soon show positive trends.8,27,33 Future QI initiatives in maternity care practices should include sociodemographic data to understand the impact that the BFHI has on minority and disadvantaged populations. In addition, future QI initiatives involving the BFHI should use a more robust reporting system that is automatic, less burdensome, and integrated into electronic health records, with the potential to enhance continuous QI in maternity care practices.

**CONCLUSIONS**

A nationwide initiative helped 72 (80%) of 90 hospitals achieve Baby-Friendly designation. This outcome is an unprecedented accomplishment, almost doubling the number of hospitals designated since US designation began in 1990. Implementation of the BFHI in this initiative was associated with a significant increase in exclusive breastfeeding. QI methods have great potential to accelerate adoption of care practices that result in substantial improvements in health.

**ACKNOWLEDGMENTS**

The authors acknowledge all of the leaders, managers, hospital staff, nurses, physicians, mothers, families, and communities from the 89 hospitals that participated in BFB (designated facilities listed at: http://breastfeeding.nichq.org/stories/designated-teams) who worked diligently on this project throughout the project period and continue to improve maternity care practices across the United States. They also acknowledge the collaboration of Baby-Friendly USA and the US Breastfeeding Committee for facilitating changes in the hospitals and communities involved. This project would not have been possible without the vision and careful guidance of members of the CDC, in particular Dr Laurence Grummer-Strawn.

**ABBREVIATIONS**

BFB: Best Fed Beginnings
BFHI: Baby-Friendly Hospital Initiative
CDC: Centers for Disease Control and Prevention
NICHQ: National Institute for Children’s Health Quality
PDSA: Plan-Do-Study-Act
QI: quality improvement

for acquiring funding and the overall project plan and actively engaged in design, measurement strategy, and implementation of the program. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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