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Improving Care of Children with Acute Decompensated Heart Failure (ADHF) Through Implementation of a Heart Failure Communication Checklist & Discharge Plan

Dana M. Schneck

School of Nursing, Duquesne University

12/5/21
Abstract

Background: Children admitted to the hospital with ADHF have been identified as a low volume high complexity population with high morbidity and mortality rates. Hospitalizations are fraught with prolonged lengths of stay and frequent readmissions prompting increased resource utilization and significant healthcare costs. Pediatric collaborative learning networks, such as the Advanced Cardiac Therapies Improving Outcomes Network (ACTION) seek to close quality gaps by engaging multidisciplinary multi-institutional teams along with patients and caregivers to share expertise, experience, and data prompting translation of evidence into higher quality, safer, cost-effective care.

Methods: A 13-item pediatric-specific Heart Failure Communication Checklist (HFcc) and Heart Failure Discharge Plan (HFdc) which standardized language usage and team communication for hospitalized heart failure patients was piloted in iterative Plan-Do-Study-Act cycles throughout the ACTION network.

Results: Between January 26, 2021, and October 5, 2021, 16 sites within the ACTION network used the HFcc in 112 patients (a total of 1483 uses) with increased form usage over time. The median length of stay was 16.5 days. For 31 patients with follow up data, 8 were readmitted. For patients with both HFcc and outcome data, HFcc use was recorded 23% of hospital days (935/4121 days). Conclusion: Iterative PDSA cycles with rounding checklists were successfully conducted throughout the ACTION collaborative learning network promoting participation across centers and improvement within centers. This collaborative learning methodology propagates ongoing quality improvement endeavors with commitment to standardizing rounding protocols and promoting smoother transition to outpatient care.
Keywords: pediatric heart failure, acute decompensated heart failure (ADHF), nurse rounding tools, interprofessional collaboration, and collaborative learning networks
Improving Care of Children with Acute Decompensated Heart Failure (ADHF) Through Implementation of a Heart Failure Communication Checklist & Discharge Plan

Heart failure (HF)–related hospitalizations occur in 11,000–14,000 children annually in the United States. Children with heart failure experience very high morbidity and mortality, with median length of stay exceeding 17 days, and mortality of 7%. (Rossano et al., 2012). In a retrospective review of the Pediatric Health Information System database, Morales-Demori et al. (2021) found that numbers of HF-related admissions are increasing. There were 4222 admissions in 2004 and 8076 in 2018 for patients with congenital heart disease and 316 admissions in 2004 and 710 in 2018 for patients with cardiomyopathy. The cost of treating pediatric heart failure is high and is rapidly increasing. For congenital heart disease, the median hospital billed charges increased from $86,742 (2004) to $244,526 (2018) and for cardiomyopathy, $72,329 (2004) to $176,639 (2018) (Morales-Demori et al., 2021). According to Nandi & Rossano (2015), inpatient hospitalizations alone could cost almost $1 billion annually. The treatment approach for optimal management involves the extrapolation of adult treatment guidelines melded with child-specific data (Das, 2018). The goal of treatment for children with HF is to maintain stability, prevent progression, and promote growth and development (Das, 2018).

Healthcare Problem Description

The goal of this quality improvement project is to better clinical outcomes in a pediatric cardiac acute care unit by implementing a standardized and comprehensive approach for patient/family/medical team communication and transition planning. Findings from this QI
LITERATURE REVIEW

An extensive review was performed utilizing the Johns Hopkins framework for systematic appraisal of literature through PubMed, CINHAL, and Cochrane Library. The relevant terms utilized included pediatric heart failure, acute decompensated heart failure (ADHF), nurse rounding tools, interprofessional collaboration, and collaborative learning networks. Inclusion criteria included full text articles within the last 10 years. Exclusion criteria included articles in a different language. The quality of evidence was good and consistent, ranging from Levels III, IV, and V, inclusive of controlled trials without randomization, cohort studies, and systematic reviews. Initial appraisal yielded 1043 articles for which 26 were included. There was also an internet search of governmental sites such as the Agency for Healthcare and Research Quality (AHRQ) which promotes evidenced-based practice across learning health systems and inpatient registries and networks such as the Pediatric Cardiac Critical Care Consortium (PC4) and the ACTION Network which champion these collaborative efforts. The following section discusses the synthesis of themes for the development of this project.

Synthesis of the Literature

The Rosswurm and Larrabee model was utilized for synthesis of the literature. This framework supports that evidenced-based practice change can occur with a combination of quantitative and qualitative data, clinical expertise, and contextual evidence. The model is comprised of six steps including:

- Assess need for change
• Build relationships and make connections between intervention and outcome
• Synthesize the gathered evidence
• Plan for the evidenced-based change in practice
• Implement the plan and evaluate the implementation
• Maintain the change (Rosswurm & Larrabee, 1999).

All steps in the Rosswurm and Larrabee model were evaluated in this synthesis of literature.

With assessing the need for change, connecting relationships, and synthesizing evidence, the literature indicates that children admitted to the hospital with ADHF have been identified as a “low volume, high complexity orphan population” (Lorts et al., 2020, p.1.) with high morbidity and mortality rates. Hospitalizations are fraught with prolonged lengths of stay and frequent readmissions prompting increased resource utilization and significant healthcare costs (Nakano et al., 2020). Pediatric collaborative learning networks seek to close quality gaps by engaging multidisciplinary multi-institutional teams along with patients and caregivers to share expertise, experience, and data prompting translation of evidence into higher quality, safer, cost-effective care (AHRQ, 2019) (Seid et al., 2014). Finally, perceived benefits of standardizing rounding protocols include the understanding of short and long-term care goals, role-modeling for trainees, effective team communication, and enhanced workflow (Burns, 2011; Sharma et al., 2013).

HF Presentation and Diagnostics

Unlike the ischemia, hypertension, and valvular inflammation found in adults, heart failure in children is most often caused by congenital malformations, cardiomyopathy, rhythm disorders, anthracycline toxicity and acquired disorders such as myocarditis or Kawasaki disease (Shaddy et al., 2018). A HF diagnosis can be associated with outflow obstruction (pressure overload), pulmonary over-circulation (volume overload), systolic dysfunction (poor
contractility) or diastolic dysfunction (poor relaxation) (Das, 2018). Right HF can present with elevated jugular venous pressure, pleural effusion, ascites, pedal edema, abdominal discomfort, and hepatomegaly. Left HF may present with dyspnea, pulmonary edema, dizziness, fatigability, nausea, vomiting, abdominal pain and feeding intolerance. The nomenclature can be further defined as either “compensated” or “decompensated” based on preservation of end-organ perfusion (Kantor et al., 2013).

Diagnosis of HF is approached by obtaining history and physical exam, laboratory investigations, and diagnostic studies. In children, laboratory studies should include complete blood count, arterial blood gas, basic metabolic panel, renal and hepatic function, lactate, and natriuretic peptide biomarkers. Chest radiography, electrocardiography, echocardiography, and cardiac magnetic resonance imaging or catheterization is obtained to assess for cardiomegaly, rhythm disturbance, structural and functional alteration, and hemodynamics respectively (Das, 2018; Kantor et al., 2013). Medical management of children diagnosed with HF involves addressing fluid overload, under perfusion, or a combination of both. When critical, management includes administration of inotropes, vasopressors, antiarrhythmics, mechanical ventilation, and progression to mechanical support if needed. Once stabilized, medications are then selected with goals to reduce preload, enhance cardiac contractility, reduce afterload, and improve oxygen delivery. Diuretics should be initiated until child is euvoletic. In chronic HF management, angiotensin converting enzyme inhibitors, angiotensin receptor blockers, and beta blockers are used to improve symptoms, shorten hospitalizations, slow progression, and optimize survival (Ahmed & Vanderpluym, 2021). Children with ADHF requiring mechanical circulatory support systems also need anticoagulation therapy (Das, 2018).
Incidence, Demographics, and Cost of Hospitalizations

The estimated incidence of a HF diagnosis in children is 0.9–7.4 out of 100,000 (Shaddy et al., 2018). The Kids Inpatient Database (KID), part of the Healthcare Cost and Utilization Project, is managed by the United States Department of Health and Human Services. In a retrospective analysis for the years 2000, 2003, 2006, and 2009, Nandy et al. (2016) found that there were 33,189 pediatric HF-related admissions. Their query found that 58-62% of the patients hospitalized had congenital heart disease and 16-18% with cardiomyopathy. There was an even distribution between males and females and mean age at admission was 5.3-5.9 years with the majority of admissions occurring in children less than 1 year of age. The mean length of hospital stays increased in the years 2000-2009 from 14.4 days to 17.1 days along with the costs of $35,079 to $72,087. For hospitalizations where mechanical support was required, there was an eightfold increase in hospital charges, $442,134 for extracorporeal membrane oxygenation (ECMO) and $462,647 for ventricular assist device (VAD) respectively (Nandy et al., 2016). A study by Rossano et al., (2018) included 142 pediatric patients form 19 centers with VAD implants from 2012 through 2016. They found that the median age was 9 years, median LOS was 81 days, and overall median hospitalization costs were $750,000. Associated co-morbidities such as renal failure, stroke, and respiratory failure had an associated threefold and sepsis a fourfold increase in hospital related charges (Nandy et al., 2016). Moffet et al., (2016) found that the average charge for a single heart failure hospitalization was $116,000 ± $5700 and median cost of readmission was $25,000. Unadjusted in-hospital mortality for children with HF was 7.4% compared to 0.4% for children hospitalized without HF (Rossano et al., 2012). Hospital admissions can be prolonged both by the development of associated co-morbidities such as renal failure, respiratory failure and sepsis and
the advancement in therapies to support patients through such illnesses (Nandi & Rossano, 2015). Historically, there has been limited data regarding morbidity, hospital length of stay, 30-day readmission rates and general longitudinal experience with pediatric heart failure management (Rossano et al., 2012). Morales-Demori et al. (2021) also described that the incidence, prevalence, and resource utilization of pediatric HF has not been well characterized. Recent data supports in-hospital mortality rates as high as 11% and 30-day readmission rates after discharge ranging from 13%-34% (Moffet et al., 2016). These hospitalizations prompt prolonged length of stay, frequent readmissions, and increased resource utilization (Nakano et al., 2020). Wittlieb-Weber et al. (2015) postulate that pediatric heart failure admissions may cost up to three times of the adult population and with the movement of healthcare reimbursement toward value-based models, improving outcomes and providing cost-effective care is necessary.

COLLABORATIVE LEARNING HEALTHCARE SYSTEM MODELS

Literature supports that a learning healthcare system model involves the collaboration of multistakeholders, quality improvement measures, and data analytics. The Agency for Healthcare Research and Quality (AHRQ) (2019) asserts that a learning health system supports the framework of value-based care and integrates internal data and experience with external evidence to improve patient care (e.g. “see Appendix A”). Leaders can corroborate ideas and create a network that is capable of organizing processes regarding shared governance and policies, network management, quality improvement, research facilitation, and engagement and information technology. Quality improvement measures can provide ongoing learning opportunities within and across network participants (Britto et al., 2018). As discussed by Nembhard (2019) and acknowledged as the mission of the Improve Care Now Network (2020), a
collaborative organization working to improve outcomes for those with Crohn’s disease and ulcerative colitis, the “share seamlessly and steal shamelessly” approach to collaboration fosters an atmosphere of all teaching and all learning.

The Advanced Cardiac Therapies Improving Outcomes Network (ACTION) adopted the “share seamlessly and steal shamelessly” credo and created an international collaborative network to improve quality and increase transparency of pediatric HF care across inpatient and outpatient domains. With the complexity and high morbidity and mortality of children suffering from heart failure, variability in care delivery should be minimized (Lorts et al., 2020). Recent ACTION endeavors driving clinical improvement involve practice harmonization protocols, stroke prevention pathways, and data supporting United States Food and Drug Administration (FDA) approval of new ventricular assist devices in pediatrics (O’Connor et al., 2021). One initiative put forth by ACTION seeks to standardize the definition, classification, and documentation of HF in children across participating centers in network (Peng et al., 2019). With 22 pediatric cardiac centers participating, ACTION has launched a quality improvement initiative where heart failure communication checklists are utilized for rounding and discharge purposes with plans to trend number of days per week the tools were used, hospital length of stay, heart failure score trend during stay, and 30-day readmission rates respectively.

**Rounding Checklists**

Care communication checklists utilized adjunctively during multidisciplinary rounds promotes improvement in collaboration and communication by enhancing thoroughness, maintaining continuity, and closing communication loops (Boydston, 2018). Boydston (2018) did not find that family participation during rounds enhanced outcomes as there was variability in the degree of availability and desirability to participate. Clark et al. (2019) employed plan-do-
study-act (PDSA) cycles to evaluate a clinical rounding checklist over a 12-month period in a general pediatric unit at a free-standing children’s hospital. With the checklist monitoring eight domains, such as skin assessment, alarm settings, need for IV or IV fluids, the team did not ultimately recommend the use of checklist. They found that only one of eight domains improved with the checklist use (cardiorespiratory monitor duration), but LOS was not affected, and completion was found to be burdensome during the rounding process. Conversely, Sharma and Peters (2013) found that rounding tools empowered nurses to contribute and influence patient management while downplaying any perception of a hierarchical or authoritative communication style. They also found the rounding tool a useful measure to punctuate the end of the conversation regarding a plan of care whilst in the company of the multidisciplinary team (Sharma & Peters, 2013).

**IHI Quality Improvement Framework**

The Institute of Healthcare Improvement’s (IHI) Triple Aim framework seeks to improve patient experience, reduce per capita healthcare costs, and improve population health (Institute for Healthcare Improvement, 2021). The IHI made five recommendations for healthcare organizations to consider for reaching Triple Aim goals. They include involving individuals and families when designing care models, redesigning primary care services and structures, improve disease prevention and health promotion, building a cost-control platform and supporting system integration and execution (McCarthy & Klein, 2010). A Plan-Do-Study-Act (PDSA) methodology is a common quality improvement measure intended to demonstrate change that occurs over iterative cycles resulting in improvement of healthcare outcomes (e.g., “see Appendix B”). Predictions of outcomes and assignment of tasks are defined during the planning phase (Plan), the plan is then implemented (Do), results are obtained and analyzed (Study), and plan is
adopted, adapted, or abandoned (Act). The learning from one cycle serves in the planning for subsequent cycles (Institute for Healthcare Improvement, 2021).

For this DNP quality improvement project, and in accordance with the Institute of Healthcare Improvement’s Triple Aim framework, PDSA cycles will be employed to test the usefulness of rounding tools and assess their individual clinical site-specific effectiveness. Participation with the ACTION collaborative will be promoted thus contributing to population health outcomes. In the following sections, evaluation of the implementation phase and identification of strengths and weaknesses for maintaining the change will be discussed.

**DESCRIPTION OF DNP PROJECT**

**DNP Project Purpose**

The purpose of this quality improvement project is to conduct a PDSA involving the implementation of a Heart Failure Communication Checklist (HFcc) and Heart Failure Discharge Plan (HFdc) to standardize language usage and team communication for hospitalized heart failure patients to promote higher quality, safer, efficient care. These quality improvement efforts stand to improve outcomes during ADHF admission and effectively transition patients to outpatient care with reduction in readmissions. As shown in Table 1, the project’s aims and objectives will be outlined.
Table 1

Project Aims and Objectives

<table>
<thead>
<tr>
<th>#1 Plan: Assess need and prepare for Heart Failure Communication Checklist (HFcc) and Heart Failure Discharge Checklist (HFdc)</th>
<th>1.1 Assess need for rounding tools with analysis of pediatric ADHF population 1.2 HFcc and HFdc plan to begin checklist utilization August through September 2021  A. Completion of an educational session with stakeholders (medical and nursing staff)  B. Establish process map to delineate workflow and staff responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>#2 Do: Implementation of HFcc and HFdc for two 4-week cycles</td>
<td>2.1 Assignment of HF nurse practitioner to initiate HFcc with appropriate patients. 2.2 Monitor utilization of HFcc and HFdc 2.3 Moderate team communication and record field note documentation of strengths and limitations of the tools and process for each four-week cycle 2.4 ACTION Network data to REDCap</td>
</tr>
<tr>
<td>#3 Study: Illustrate findings from two 4-week PDSA cycles.</td>
<td>3.1 HFcc  ▪ Descriptive Data  ▪ ACTION Network Data: Run Charts 3.2 HFdc  ▪ Descriptive Data  ▪ ACTION Network Data: Run Charts</td>
</tr>
<tr>
<td>#4 Act: Recommendations for HFcc and HFdc</td>
<td>4.1 Adopt, Adapt, or Abandon HFcc 4.2 Adopt, Adapt, or Abandon HFdc</td>
</tr>
</tbody>
</table>

METHODOLOGY

The ACTION Network project charter inclusion criteria for PDSA implementation and checklist usage requires that patients have ADHF symptoms leading to hospitalization and diagnosis including dilated cardiomyopathy (primary and secondary), restrictive cardiomyopathy
(primary and secondary), hypertrophic cardiomyopathy (primary and secondary),
arhythmogenic right ventricular cardiomyopathy, myocarditis, failing single ventricle congenital
heart disease, two-ventricle congenital heart disease, and heart transplant graft dysfunction. Any
patient that receives a ventricular assist device during the admission is eligible. Exclusion
criteria for participation include patients with history of heart failure but admitted to hospital
with a non-heart failure diagnosis. Patients transplanted during a ADHF admission are eligible
for the daily checklist but not the discharge checklist. The forms are to be completed and
discussed daily on team rounds with goal to be inclusive of the attending physician, support staff
(advanced practice providers), trainees (residents and fellows), bedside nurse, family member,
and patient if age appropriate. Goal for checklist usage was four days per week.

The Heart Failure Communication Checklist (HFcc) (e.g. “see Appendix C”) is a 13-
item pediatric-specific tool developed by expert consensus through ACTION covering key HF
assessments and goals including weight trend, cardiac rhythm, symptoms, fluid management,
anticoagulation, HF medications, HF severity score and barriers to discharge. The Heart Failure
Discharge Checklist (HFdc) (e.g. “see Appendix D”) is a pediatric-specific checklist to be
completed one time prior to discharge with multidisciplinary team, patient, and family to
promote smooth transition to outpatient care.

Target Setting/Population/Stakeholders

The target setting is a 21-bed pediatric cardiac unit within a 315-bed acute-care, free-
standing children’s hospital which is part of an urban academic medical center. The population
in this quality improvement project involve children and young adults admitted to the hospital
with an acute decompensated heart failure (ADHF) diagnosis. Identified stakeholders include
the DNP student, faculty mentor, residency preceptor, patients, family members, nurses,
physicians, hospital administration, and the Advanced Cardiac Therapies Improving Outcomes Network (ACTION). The ACTION Collaborative proposed rounding tools be used for all patients admitted with ADHF to the Heart Failure Cardiology Service and for whom the Heart Failure Cardiology Service was formally consulted. For participation locally, it was decided to exclude patients in the cardiac intensive care unit and other acute care units as their rounding protocols differ from the acute care cardiac unit. This decision did impact project outcomes as children with lengthy segments of heart failure-related hospitalizations while in critical care were not included. This will be discussed further in the project summary section.

**IMPLEMENTATION**

In the planning phases of the project, the ACTION network timeline involved a design phase from March 2020 through January 2021. The rollout of PDSA cycles in participating institutions began in January 2021 with planned conclusion in October 2021. Virtual meetings were held every other month to review degree of participation and provide rolling tallies of rounding form usage. At the local center, staff training was completed in June 2021. Retrospective data collection to demonstrate need for project was completed in July 2021. PDSA cycles were instituted in August and September 2021 with final data analysis completed in October 2021. In Table 2, methods of data illustration are summarized.
Table 2

Data Management Plan

<table>
<thead>
<tr>
<th>Data</th>
<th>Data Display and Management</th>
<th>Data Analysis</th>
<th>Strengths</th>
<th>Weaknesses</th>
<th>Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aim 1</td>
<td>Table</td>
<td>Descriptive</td>
<td>Supports project need</td>
<td>Difficult to access local data</td>
<td>June 2021</td>
</tr>
<tr>
<td>Retrospective Patient Data</td>
<td></td>
<td></td>
<td>Reliable ACTION Data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aim 1</td>
<td>Process Map</td>
<td>Descriptive</td>
<td>Visibility of process</td>
<td>Simplistic visual of a complex process</td>
<td>July 2021</td>
</tr>
<tr>
<td>Implementation Plan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aim 2</td>
<td>Table</td>
<td>Descriptive</td>
<td>Identify qualities and barriers</td>
<td>Bias</td>
<td>August and September 2021</td>
</tr>
<tr>
<td>Field Notes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aim 3</td>
<td>Run Chart</td>
<td>Display data values in time sequent</td>
<td>Visualize the stability control</td>
<td>Reliable tool in QI</td>
<td>October 2021</td>
</tr>
<tr>
<td>HFcc form usage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aim 3</td>
<td>Unavailable</td>
<td>Unavailable</td>
<td>Unavailable</td>
<td>Unavailable</td>
<td>October 2021</td>
</tr>
<tr>
<td>HFdc form usage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Aim 1 “Plan” Phase of the PDSA Cycle

The ACTION network asked for voluntary submission of specific diagnosis counts from October 2019 through January 2021 to demonstrate need for the HF project. While the local center did not submit data, other participating centers indicated 248 admissions for a combined dilated cardiomyopathy and myocarditis diagnosis, 173 for congenital heart disease, 13 for
transplant graft dysfunction, 7 for restrictive cardiomyopathy, and 2 for hypertrophic cardiomyopathy. Locally, retrospective data collection from 2019 through year-to-date (YTD) 2021 revealed top diagnoses prompting hospitalization for ADHF included dilated cardiomyopathy, myocarditis, and congenital heart disease with length of stay (LOS) of hospitalization ranging from 5.3 to 170 days. Additional significant local data supporting a need for the QI project involved YTD ventricular assist device (VAD) implantation, days hospitalized with VAD, LOS, and outcomes as presented in Table 3.

**Table 3**

*Local VAD Hospitalization Data YTD 2021*

<table>
<thead>
<tr>
<th>Patients (8)</th>
<th>VAD Days</th>
<th>LOS</th>
<th>Outcome</th>
<th>ED/Readmit</th>
</tr>
</thead>
<tbody>
<tr>
<td>J.H.</td>
<td>114</td>
<td>147</td>
<td>Transplant (Tx)</td>
<td></td>
</tr>
<tr>
<td>L.S.</td>
<td>Implant 3/12/21</td>
<td>111</td>
<td>Alive, outpatient</td>
<td>9 Emergency Dept visits, 5 readmissions</td>
</tr>
<tr>
<td>L.F.</td>
<td>16</td>
<td>103</td>
<td>Explant</td>
<td></td>
</tr>
<tr>
<td>K.G.</td>
<td>72</td>
<td>113</td>
<td>Tx</td>
<td></td>
</tr>
<tr>
<td>N.N.</td>
<td>114</td>
<td>138</td>
<td>Tx</td>
<td></td>
</tr>
<tr>
<td>A.O.C.</td>
<td>136</td>
<td>237</td>
<td>Tx</td>
<td></td>
</tr>
<tr>
<td>A.F.</td>
<td>23</td>
<td>81</td>
<td>Explant</td>
<td></td>
</tr>
<tr>
<td>A.A.</td>
<td>Implant 9/27/21</td>
<td>Admitted 21 days June 2021. Re-admitted for VAD 9/14/21</td>
<td>Listed for Tx, remains as inpatient</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* This table depicts 8 children with VAD implantation, length of time with device, length of hospital stays, and outcomes from January 1, 2021 through October 1, 2021. One child with
An implantable VAD that was discharged to home has had several hospital readmissions and Emergency Department visits.

The final objectives for Aim 1 were met after completion of a staff training session and development of a process map which delineated workflow and staff responsibilities. The process map, as depicted in Figure 1, describes workflow with a beginning boundary when a patient is admitted through an ending boundary inclusive of REDCap data entry and 30-day follow up documentation.

**Figure 1**

*Process Map to Optimize Intervention*

Aim 2 “Do” Phase of the PDSA Cycle

In the implementation phase of the PDSA, objectives included the assignment of a HF nurse practitioner to monitor census and enroll patients. Additional duties involved recording the utilization of rounding forms daily, moderating team communication and recording field note documentation of strengths and limitations of the rounding tools and process for each four-week
PDSA cycle. Finally, the HF nurse practitioner was to upload forms and associated data to the REDCap clinical database on a weekly basis.

Running field note observations satisfied objectives for Aim 2. Nursing staff was receptive to participation in the PDSA cycles. Between many new registered nurses on the unit and multi-patient assignments, their attendance during rounds was inconsistent. Parents who signed the enrollment form for participation felt that rounding tools and the ACTION network could benefit their child’s care but their presence for rounds was also inconsistent. Cardiac Intensive Care Unit patients were excluded since they are managed by the intensivist service and have a unique rounding protocol. The cardiology HF team evaluates the patients daily as consultants. The inpatient HF nurse practitioner was noted to be the only constant team member. Attending cardiologists rotated on a weekly and residents on a bi-weekly basis thus disrupting continuity and increasing number of communication handoffs. Finally, there was recognition that the HF and heart transplant service census is unpredictable. The census was robust in the weeks leading up to the launch of the PDSA cycles, however, several patients were transplanted and then discharged before able to participate. This impacted project outcomes locally as census numbers were lower during the PDSA cycles. In addition, while it is unknown if the rounding checklists would have positively impacted the heart transplant recipients, their hospitalizations leading up to transplantation did require that careful attention was paid to the optimization of nutrition, heart failure medication regimen, and if VAD had been placed, therapeutic anticoagulation to mitigate stroke risk.
Aim 3 “Study”

Phase of the PDSA Cycle

ACTION meetings were held virtually with participating centers to review patient
enrollment, rounding form usage, and clinician feedback. Enrollment and form usage was
illustrated with the use of run charts as presented in Figures 2 and 3 respectively. In a June 2021
meeting, the HFcc usage median was 44.5 times per week. It was used 812 times with 66
individual patients at 15 sites. For each patient, it was used an average of 3.5 times per week.
There were 36 patients enrolled from 9 sites. The LOS ranged from three to 105 days with
median LOS of 17 days. In an August 2021 meeting, the HFcc usage median increased to 47
times per week. It was used 1249 times with 104 individual patients at 16 sites. For each
patient it was used and average of 3.4 times per week. There were 58 patients enrolled from 11
sites. The LOS ranged from three to 105 days with median LOS of 13 days.

This ACTION data was discussed during June and August virtual meetings and displayed
via run charts. A run chart is a tool used in quality improvement efforts which plots data
collected over time. The utility and simplicity of this tool allows for detection of trends, shifts,
cycles, or degradation of a process (Institute for Healthcare Improvement, 2021). Figure 2 and
Figure 3 illustrate ACTION data collected through iterative PDSA cycles which demonstrated
that participating centers, patient enrollment, and rounding checklist form usage increased over
time.
Figure 2

Run Chart June 2021 ACTION Meeting

Note. Illustrates frequency of rounding form usage over time.
Figure 3

*Run Chart August 2021 ACTION Meeting*

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**Note.** Illustrates frequency of rounding form usage over time.

Between January 26, 2021, and October 5, 2021, 16 sites within the ACTION collaborative used the HFcc in 112 individual patients for a total of 1483 uses which increased over time. Enrollment data was available for 73 patients (53% cardiomyopathy, 5% heart transplant, 6% other) with 38 discharged and 4 deaths at the time of analysis. The median LOS was 16.5 days. For 31 patients with follow up data, 8 were readmitted. Patients with both HFcc and outcome data, the HFcc was recorded 23% of hospital days (935 out of 4121 days). Further descriptive data satisfied the objectives for Aim 3.

Complete ACTION data for the use of the HFdc was not shared due to ongoing analysis regarding the effect on outpatient transition and readmission rates. Feedback from 19 out of 22
participating centers did include that seven out of 19 found that the HFdc took only five to ten minutes to complete. Fifteen out of 19 centers planned to include the HFdc in the workflow for their outpatient team. All 19 centers felt that the form would be helpful for outpatient medication titration. Eight out of 19 centers felt that both rounding forms helped patients with goal directed therapy.

**Aim 4 “Act” Phase of the PDSA Cycle**

The objectives in Aim 4 include recommendations for adopting, adapting, or abandoning the HFcc and HFdc. At the completion of the PDSA cycles, ACTION concluded that the use of rounding checklists across centers is feasible. They also recommended that additional PDSA cycles are considered to continue to study form usage, LOS, and 30-day readmission rates. Locally, adoption of the HFcc would be considered after repeating PDSA cycles when the census is higher, and more time could be afforded to adjust or modify the process. The HFdc would be best adapted by integrating HF-specific verbiage and concepts into pre-existing hospital discharge documentation to best transition patients to outpatient care.

**DNP Project Summary, Interpretation, Limitations**

The iterative PDSA cycles in this quality improvement project supports that collaborative learning and data sharing propagates continued and new quality improvement projects. A collaborative learning health system promotes participation across centers and improvement within centers. At the local level, a healthcare silo was identified between the cardiac intensive care unit (CICU) and the acute care cardiac unit which can lead to “communication errors, hindrances to teamwork, and lack of knowledge sharing” (Paterson et al., 2014). It was also
identified that a focus is needed on role determination and team expectation for rounding content and style for ADHF patients on a continuum from critical care through discharge. In terms of cost-savings, a formal economic evaluation was not performed. Significant cost savings may be determined if recent and future quality improvement initiatives can demonstrate decrease in hospital LOS, decrease in morbidity rates, and decrease in readmissions.

At a local level, limitations acknowledged for this quality improvement project included small sample size due to low patient census and short project timeframe. Timing of the PDSA cycles unfortunately began after several transplant recipients were discharged from the hospital after lengthy heart failure-related hospital admissions. Team buy-in, allowing time to teach about the process, and incorporating rounding checklists into workflow was difficult with discontinuity in the rounding team. Patients hospitalized with ADHF in the CICU should be included in future quality improvement projects along with efforts to unify critical and acute care personnel. In addition, one HF nurse practitioner with assigned duties inclusive of project management, data retrieval, data entry, and data analysis proved to be difficult and time limiting particularly with healthcare system roadblocks to retrospective data retrieval. Recommendations include repeating PDSA cycles when census is robust, requesting broader access and training for data retrieval endeavors, dividing duties of project between additional team members, and incorporating rounding and discharge checklists into current electronic medical record.

Conclusion

ACTION’s mission with its collaborative practice methodology is to improve the outcomes of pediatric and congenital heart failure patients by sharing both data and learning. This quality improvement project demonstrated that iterative PDSA cycles with rounding
checklists were successfully conducted throughout the ACTION collaborative learning network promoting participation across centers and improvement within centers. This collaborative learning methodology propagates ongoing quality improvement endeavors with commitment to standardizing rounding protocols and promoting smoother transition to outpatient care. Quality improvement projects will continue to focus on children with ADHF, VADs, and adults with congenital heart disease. ACTION’s vision invokes the spirit of inquiry and desire for improvement while prompting efforts to improve processes and outcomes on a local level.
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References


https://www.ahrq.gov/learning-health-systems/about.html


https://doi.org/10.21037/cdt-20-358


https://doi.org/10.11124/JBISRIR-2017-003350


https://doi.org/10.1542/hpeds.2018-0150


https://doi.org/10.3390/children5070088


[https://doi.org/10.1016/j.jpeds.2016.06.003](https://doi.org/10.1016/j.jpeds.2016.06.003)


[https://doi.org/10.1016/j.jpeds.2019.09.049](https://doi.org/10.1016/j.jpeds.2019.09.049)


[https://doi.org/10.1017/S1047951115002280](https://doi.org/10.1017/S1047951115002280)


[https://doi.org/10.1097/HMR.0b013e31822af831](https://doi.org/10.1097/HMR.0b013e31822af831)


https://doi.org/10.1016/j.healun.2019.08.002


Appendix A

Learning Health Systems

Systematically gather and create evidence.
Apply the most promising evidence to improve care.

https://www.ahrq.gov/learning-health-systems/about.html
Appendix B

Building knowledge with PDSA Tests

Appendix C

Heart Failure Daily Checklist

Date: ________________  ACTION ID: ________________

**Diagnosis (circle):** Cardiomyopathy or Congenital Heart Disease

1. My dry weight is: _______ kg.  My weight today: _______ kg

2. My rhythm is (circle): ____ Tach or ____ Arrhythmia

3. I am (circle):  Good Appetite / Tolerating Feeds / My Stomach Hurts / No Appetite / Nausea / Vomiting

4. Today I am (circle): 
   - Dry & Warm
   - Wet & Warm
   - Dry & Cold
   - Wet & Cold

5. My fluid goal: minimum ______ ml/day AND maximum ______ ml/day

6. My approximate goal fluid balance is: ________________

7. My goal blood pressure is: systolic range ______ or MAP range ______

8. My goal oxygen saturation is: ________________

9. I am (circle): __ NO anticoagulation OR anticoagulated (med): _______ with goal level _______

10. My oral heart failure medications are (circle): at goal OR being optimized

<table>
<thead>
<tr>
<th>Respiratory Insufficiency</th>
<th>None</th>
<th>Mild 1</th>
<th>Moderate 2</th>
<th>Severe 3</th>
<th>Life-Threatening 4</th>
<th>Sub-Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal</td>
<td>Mild increased WOR but no respiratory support beyond NCIC</td>
<td>Requiring CPAP, BIPAP, HFNIC</td>
<td>Mechanical ventilation</td>
<td>ECMO</td>
<td></td>
</tr>
<tr>
<td>Feeding Intolerance</td>
<td>Full PO Diet</td>
<td>Intermittent nasoenteric, nasoenteric or feeding tube supplementation</td>
<td>Moderate abdominal symptoms OR not tolerating full enteral nutrition</td>
<td>Severe abdominal symptoms, unable to tolerate enteral nutrition beyond tropics</td>
<td>Active bleeding or proven mesenteric ischemia</td>
<td></td>
</tr>
<tr>
<td>Inactivity/Immobility</td>
<td>No limitations</td>
<td>Mild inactivity, can participate in play/ambulation or feeding (infants) &gt; 15 minutes</td>
<td>Moderate inactivity limiting play/ambulation or feeding (infants) to &lt; 15 minutes</td>
<td>Referred due to symptoms, mechanical ventilation</td>
<td>Deep sedation or paralysis to meet metabolic demands</td>
<td></td>
</tr>
</tbody>
</table>

11. My Heart Failure Score:

   Sun ______  Mon ______  Tues ______  Wed ______  Thurs ______  Fri ______  Sat ______

12. My heart failure plan today is (examples: extubate, ambulate, eat 3 meals): ________________

13. Barriers to discharge (circle): symptoms / medication optimization / discharge logistics

FIKDLGT, POSTED AT BEDSIDE, AND READ BACK DURING ROUNDS BY: ________________

Days Completed (Circle): Sun Mon Tue Wed Thu Fri Sat
# Appendix D

## Heart Failure Discharge Plan

Date Completed: ____________  Patient Initials: ____________

This plan is used as a CQI tool for improving outcomes by better discharge planning with providers, patients, and families. Use the QR code to fill in the plan electronically and download a PDF for sharing.

### I. General Patient Information

<table>
<thead>
<tr>
<th>Admit Date:</th>
<th>Discharge Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Admit Weight:</th>
<th>Discharge Weight:</th>
<th>Height:</th>
</tr>
</thead>
<tbody>
<tr>
<td>___ kg</td>
<td>___ kg</td>
<td>___ cm</td>
</tr>
</tbody>
</table>

**Systemic V EF at admission:**___% or qualitative function if EF not available (circle below):

- Normal
- Mildly Decreased
- Moderately Decreased
- Severely Decreased

**Systemic V EF at discharge:**___% or qualitative function if EF not available (circle below):

- Normal
- Mildly Decreased
- Moderately Decreased
- Severely Decreased

Precipitating factor(s) for HF admission (circle all that apply):

- Index Admission
- Fluid Overload
- Non-adherence to Medications
- Non-adherence to Fluid/Diet Recommendations
- Concurrent Infection
- Decrease in Ventricular Function
- No Obvious Inducing Event/Factor for HF Exacerbation
- Other: ________________________

Is this patient going home on a VAD? (circle): Yes / No

### II. Follow Up Schedule

Follow up HF appointment (Date): ____________  Follow up labs (Date): ____________

Follow up echocardiogram (Date): ____________  Follow up PCP Appt. (Date): ____________

Physical Activity Recommendations (circle option below):

- Routine Daily Activities
- Recreational Activities (Non-Competitive) Permitted
- No Restrictions
- Not Discuss

Vaccines UTD? Yes / No; if not, plan for updating: ________________________

Oral Care UTD? Yes / No; if not, plan for updating: ________________________

SEE Prophylaxis Recommended? Yes / No

Contact information for HF team provided? Yes / No
III. Heart Failure Medications

**ACE/ARB/ARNI**

Medication(s), Dose(s), and Frequency prior to admit: ____________________________

Medication(s), Dose(s), and Frequency at discharge: ____________________________

Goal Dose (mg) and Frequency: ____________________ (if applicable), goal dose mg/kg/day ____________________

Reason(s) for Not Meeting Goal Dose Prior to Discharge (circle below all that apply):

- Not Applicable (Currently at Goal)
- Hypertension
- Actively Titrating Now
- Renal insufficiency
- Actively Titrating Other Medication First
- Adverse Patient Symptoms: ____________________
- Hypotension
- Other: ____________________

Titration Plan:

**Beta Blocker**

Medication(s), Dose(s), and Frequency prior to admit: ____________________________

Medication(s), Dose(s), and Frequency at discharge: ____________________________

Goal Dose and Frequency: ____________________ (if applicable), goal dose mg/kg/day ____________________

Reason(s) for Not Meeting Goal Dose Prior to Discharge (circle below all that apply):

- Not Applicable (Currently At Goal)
- Hypotension
- Actively Titrating Now
- Bradycardia
- Actively Titrating Other Medication First
- Adverse Patient Symptoms: ____________________
- Other: ____________________

Titration Plan:
**Alendronate Antagonist**

Medication(s), Doses, and Frequency prior to admit: ______________________________

Medication(s), Dose(s), and Frequency at discharge: _____________________________

Goal Dose and Frequency: __________________________________________ (if applicable), goal dose mg/kg/day __________________

Reason(s) for Not Meeting Goal Dose Prior to Discharge (check below all that apply):
- Not Applicable (Currently At Goal)
- Hyperkalemia
- Actively Titrating Now
- Renal Insufficiency
- Actively Titrating Other Medication First
- Adverse Patient Symptoms: ______________________________
- Hypotension
- Other: ___________________________________________________________________

Titration Plan: __________________________________________________________________

**Diuretics**

Medication(s), Dose(s), and Frequency prior to admit: ______________________________

Medication(s), Dose(s), and Frequency at discharge: _____________________________

Congestion/Exacerbation Plan: __________________________________________________________________

**Anticoagulation**

Medication(s), Dose(s), and Frequency prior to admit: ______________________________

Medication(s), Dose(s), and Frequency at discharge: _____________________________

Goal Anticoagulation Levels (if applicable): __________________________________________________________________
Other HF Medications/Instrope

Medication(s), Dose(s), and Frequency prior to admit: __________________________

Medication(s), Dose(s), and Frequency at discharge: __________________________

IV. Fluid/Diet

Diet: Regular/No Restrictions Other: __________________________

Fluid Restriction: None/ad lib Other: _________ mL

Sodium Restriction: None Other: _____________ mg/day

Plan for Outpatient Diet or Fluid Changes: __________________________

V. Labs

BNP at admission: _____________ BNP at discharge: _____________

NT-proBNP at admission: _____________ NT-proBNP at discharge: _____________

Creatinine (mg/dL) at admission: _____________ Creatinine (mg/dL) at discharge: _____________

Hemoglobin (g/dL) at admission: _____________ Hemoglobin (g/dL) at discharge: _____________

Iron Deficient during hospitalization? (circle): Yes/No/Not Assessed

On iron therapy? Yes- Oral Iron Therapy/Yes-Received IV Iron/No

VI. Additional Information or Instructions