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The Development And Validation Of An Acuity Tool In A Pediatric Outpatient Burn Clinic

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THE DEVELOPMENT AND VALIDATION OF AN ACUITY TOOL

IN A PEDIATRIC OUTPATIENT BURN CLINIC

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Abstract

In outpatient settings, the role of nurses has shifted from episodic, reactive care to management of patients with higher acuity. In a pediatric outpatient clinic specializing in burn injuries, it became apparent that the lack of an acuity tool to measure patient complexity challenged efficient nurse staffing and patient satisfaction. In this improvement project we developed a patient acuity tool that would help to determine nurse staffing, improve workload efficiencies, and improve the delivery of care.

Patient acuity tools and patient classification systems are used throughout the healthcare system to determine nurse staffing requirements. These tools originated in the 1960's for the purpose of forecasting staffing needs and to project and monitor workload in inpatient settings.(1) In an integrative review of patient classification systems and acuity systems, Fasoli and Haddock found that there were a number of inpatient acuity tools in existence and a number of hybrid models that have been developed to meet the needs of hospital systems and staffing mandates.(2) Although there have been tools for measuring patient acuity in tertiary care settings since 1960, there are no widely accepted systems for measuring patient acuity in outpatient settings.(3) The impact of the Affordable Health Care Act of 2010 and the challenge to adopt the Triple Aim of better access, better quality of care at lower cost prompted development of acuity-adjusted

staffing and objective and reliable patient acuity tools.(4) The complexity of the patient

populations in ambulatory care requires high levels of nursing care, in contrast with typical

outpatient clinics from past decades. The role of nurses has shifted from episodic, reactive care

to management of patients with higher acuity requiring sophisticated and coordinated care.(5)

Given the diversity of ambulatory care settings, it is evident that a "one-size-fits-all" patient

acuity tool is not useful. However, successful tools include similar approaches such as simplicity

of use, incorporation of psychosocial aspects of care, and development of a quantification

scheme for indicators of care.(1) Therefore, the purpose of this project was to develop a patient

acuity tool designed specifically for a pediatric burn clinic based on an evidence-based model

that would help to determine nurse staffing, improve workload efficiencies, potentially improve

patient and staff satisfaction and ultimately improve the delivery of care for this setting.

Patient acuity can be defined as "the categorization of patients according to an assessment of

their nursing care requirements".(1,p.284) Through exploration of the concept of acuity within

the context of Holzemer's *Outcomes Model for Health Care Research,* Brennan and Daly

provided a theoretical basis for establishing the attributes of acuity and defined patient acuity as

"a measure of the severity of illness of the patient and the intensity of care the patient

requires".(6, p.1119) This definition provides the foundation from which patient acuity tools are

created. Holzemer lists the components critical to the quality of patient acuity tools to include

(1) use of the nursing process, (2) being adaptable and flexible in nature, and (3) having

credibility (reliability and validity). (6) The nursing process is an essential component of acuity

tools as this process structures the professional components and critical thinking of the delivery

of care by nurses. Harper and McCully report that many patient acuity tools do not "accurately

measure the social and psychological aspects of the nursing process" and are "task oriented. (1,

p.286) However, the nurse plays an important role in the social and emotional outcomes of the patient recovery process and these processes are essential to capture in an acuity tool.

Outpatient nursing acuity tools include workload measurement systems, patient classification instruments and nursing activity classification systems. (7) The majority of these instruments have been adapted from those utilized in the inpatient setting. A wide variety of methodologies including time and motion studies, patient aggregation, patient factor analysis, and staffing ratio per patient visit have been integrated into acuity tools.(7) All have components that include a data collection instrument, indicators of care and a quantification scheme.(8) The indicators of care describe the types of activities provided as nursing services and represent nursing actions that have the greatest effects on nursing time or intensity.(8)

One example of a model derived from an inpatient tool, the Patient Intensity for Nursing: Ambulatory Care (PINAC) was adapted for the ambulatory care setting by Prescott & Soeken.(9) As with the inpatient-oriented Patient Intensity for Nursing Index (PINI), the PINAC has three conceptual dimensions: severity of illness, complexity of care and patients' psychosocial needs.(10) Severity of illness includes the seriousness of the patients' illness; complexity refers to the patients' knowledge base and decision making capabilities. In place of dependency needs, PINAC includes psychosocial needs referring to teaching and emotional support. Unlike the PINI, additional components related to outpatient care are included (i.e. new vs. returning patient, type of service, telephone triage, and walk-in).(9) While conceptual dimensions are important components of an acuity tool, a rating system of indicators of care is essential to quantify the care required for a patient.

Vorthems et al.(11) reported a pilot study conducted within a chemotherapy infusion outpatient department of a 489-bed community based hospital. This department averaged 80 patients visits daily with reasons for visits including infusions for hydration, antibiotics, chemotherapy, transfusions of blood products, venous access device care and injections. Increasing patient volumes, treatment complexities and heightened awareness of staffing inefficiencies were leading nurse managers to initiate an evidenced-based staffing model based on patient acuity. A five point acuity based system with identification of common categories of treatment regimens and unique patient care needs was created by consensus model, with a six month pilot study to test and validate the tool. The tool was fully implemented following the completion of the pilot project and has since been incorporated into the electronic medical system. Lessons learned as a result of the project include the importance of clear communication, clear expectations and workload transparency during the pilot to ensure staff buy-in. The model has resulted in a balanced workload for the nursing staff, improved work environment and enhanced the patient care experience.(11)

At a small pediatric hospital in Boston, MA specializing in care of patients with burn injuries, orthopaedic diagnoses, and other congenital anomalies, the inpatient units utilize a patient acuity tool that measures ten domains including assessment needs, task/procedure, complexity, activity/mobility, activity of daily living, comfort/emotional, potential for fall/injury, teaching, family participation, indirect care, and other factors (including ability of the patient to travel off the patient unit).(12) The tool is completed each shift for every patient and entered into an excel spreadsheet utilized by the inpatient nurse managers for determining allocation of nursing staff and budget forecasting. As of March 2016, data from this acuity tool are also submitted to the state of Massachusetts as a requirement for the ICU staffing laws.(13)

However, the inpatient acuity tool is not easily transferrable to the outpatient setting of this hospital, as the focus of the tool is the amount of nursing care needed to meet one patient's needs during a twelve hour time period. Hoffman and Wakefield reported several challenges of applying inpatient acuity systems to outpatient settings.(14) They found that inpatient acuity systems are based on patients' activities of daily living (i.e. bathing, feeding, and dressing), which are not the focus of outpatient nursing care.[9] Nursing technologies vary greatly between the inpatient and outpatient setting. For example, use of ventilators, monitoring systems and infusion pumps play a significant role in inpatient nursing care. Inpatient acuity systems use a prospective approach in determining nurse staffing as there is adequate time to assess and determine patient acuity and determine staffing needs for future shifts. However, the rapid turnover of patients in the outpatient setting requires a retrospective system given the limited time for patient assessment and determination of nurse staffing. The ever-changing case-mix, patient complexity, and volume in the outpatient setting require a rigorous method for quantifying patient acuity.(14)

Rationale for Development of a Pediatric Ambulatory Acuity Tool

In the pediatric outpatient clinic described in this paper, allocation of the nursing staff is currently determined by the average number of scheduled appointments per day and the type of clinics held on each day. For example, the Small Acute Burn Clinic maintains a certain number of appointment slots on a daily basis but in addition a simultaneous Plastic Reconstructive Clinic is held once weekly requiring re-allocation of the existing nursing staff. Variables including new patient add-ons, complexity of the patients' burn injuries, and the developmental level of the patients create daily staffing challenges. Difficulties in matching nursing assignments to the

dynamic patient characteristics have the potential to negatively impact the provision of quality care, patient wait times, and staff morale.

The absence of an appropriate patient acuity tool became more apparent as the complexity of patients increased. Factors contributing to this complexity included shorter length of inpatient stays for plastic reconstructive procedures (average length of stay had decreased from 4.8 to 2.8 days between 2010 and 2016) and increased volume of outpatient surgical procedures (increased from 472 to 844 between 2010 and 2015, a 44% increase).(15) Patients returning to the clinic for follow-up care from an inpatient stay of one to two days or outpatient surgery required additional reinforcement of post-operative education, medication reconciliation, pain management and surgical site incision monitoring. Therefore, this demand resulted in an increased nursing staff workload. Additionally, patient volume in the outpatient clinic from 2010-2015 had increased by 5%, with a total of 6063 patient encounters in 2015, without a change in the staffing model.(15) The nursing staff reported that they were "busier" and were requesting additional nursing support. Routine clinic visits booked in 15 minute increments were lasting 25-30 minutes, patient wait times were longer and patient satisfaction scores related to wait times had decreased from 96% in 2011 to 89% in 2014 (Press Ganey®, 2011-2014). In the 2014 National Database of Nursing Quality Indicators (NDNQI®) survey, nursing staff reported a significant drop in scores in the outpatient department from 2013 in the areas of "Nursing Foundations in the Quality of Care" and "Job Enjoyment Scale" by 7% and 17% respectively. Therefore, the development and use of a patient acuity tool that was designed specifically for an outpatient pediatric specialty clinic based on an evidence-based model addressed several important goals. These goals included an additional approach to determine nurse staffing, improvement of workload

efficiencies, potential improvement of patient and staff satisfaction and ultimately improving the delivery of care for this setting.

Methods

Setting

This practice improvement project was conducted at the outpatient department of Shriners Hospitals for Children®—Boston, a 30 bed pediatric surgical specialty hospital specializing in care of patients with burn injuries, orthopaedic diagnoses, and other congenital anomalies. Approval for the practice improvement project was obtained by the hospital's nursing administration and institutional review board.

Development of the Acuity Tool

The outpatient department clinical staff and nursing administration were briefed on the project proposal and the procedures prior to initiation of the project. Ongoing communication and updates of the status of the project occurred to maintain "buy-in" and positive relationships with staff and administration. Initial patient acuity and care data were collected through unstructured observations and collection of field notes of the outpatient nursing staff during a period of two weeks. The observations included observations of direct and indirect nursing care activities during normal work hours (6:30am-5pm). Field notes included a combination of activities performed by the nursing staff with a time element, location of activity, and personal notes of the observer. After completion of the observation phase, the data were compiled into categories of patient care activities.

The acuity tool was modeled after a combination of Vorthem's five point acuity based system and Prescott and Soeken's PINAC with conceptual dimensions of severity of illness, complexity of care and patient's psychosocial needs; adaptations specific to a pediatric burn specialty clinic were incorporated.(9,11) Common patterns of patient care activities were identified and sorted yielding a set of indicators representative of the multiple layers of nursing care provided in the outpatient department. Indicators included wound care activities, medication reconciliation, patient education, post –operative procedures (i.e. suture removal) and psychosocial needs. The indicators chosen were patient-centered, measurable and objective. Under each indicator, direct and indirect patient care activities were itemized with a correlated point system.

The initial draft of the Pediatric Ambulatory Acuity Tool (PedAAT) was presented to a team of nurses from the outpatient department for comment and review. Through guided discussion led by the first author with the nurses, adaptations were made to the tool; additional indicators and point system changes generated thoughtful discussion by the nursing team.

After completion of the draft acuity tool, an expert panel reviewed for clarity, comprehensiveness, definition and representativeness. Members of the expert panel were chosen based on expertise in the pediatric burn community and in the outpatient care setting.(16) The expert panel consisted of a total of 7 members, all with a present or past affiliation with Shriners Hospitals for Children®-Boston. The members included pediatric nurse practitioners, a research nurse, a clinical educator and those in leadership roles. A majority of the expert panel have published and presented on pediatric burn injuries. Revisions were made to the tool from feedback generated from the expert panel.

Evaluation of the Pediatric Ambulatory Acuity Tool

An orientation to the PedAAT was provided by the first author to staff nurses in the outpatient department. During the four week evaluation phase, staff nurses completed the acuity tool on a total of 116 patient encounters. The patient encounters were representative of the types of clinics provided in the outpatient department. Following the evaluation phase, seven staff nurses who were involved in completing the acuity tool were provided a questionnaire, using a Likert scale to rate the acuity tool on ease of use, relevance to nursing care and functionality.

Results

Expert Panel Review

Results from the expert panel review (Table 1) revealed an agreement score of 1.00 for representativeness, 0.92 for clarity, 0.86 for comprehensiveness and 0.93 for definitions of each category. (16) Revisions were made to the acuity tool based on comments and recommendations from the expert panel. For example, a category of the acuity tool had been labeled "Nursing Processes of Care"; this category was changed to "Nursing Interventions" to improve clarity of purpose. Comments from the expert panel included elevating the acuity value for "use of an interpreter" and "barriers to learning (cognitive, language, literacy and cultural) to a higher level.(Figure 1)

Results from Evaluation of the PedAAT

The final acuity tool was completed on a total of 116 patient encounters over a course of five weeks. The acuity tool was comprised of six categories (Encounter Type, Nursing Intervention, Medication Reconciliation, Patient Education and Support, Patient Behavior, and Psycho-Social Indicators) with four levels within each category. Under each level were items representative of the patient encounter. The nurse was instructed to circle the item that best represented the

interaction by the nurse each category, tally the points, arriving at the "Total Acuity" score for the patient. The final score resulted in one of four levels of acuity: low, moderate, high, or complex.

Following completion of the evaluation phase, the nurses were asked to complete a questionnaire with a five-point Likert scale for feedback on use of the acuity tool. Ease of use, relevance to practice, and willingness to use in daily practice were included in the questionnaire. The nurses were also asked open-ended questions on missing elements, burden of use and challenges. (Table 2) A common theme in the comment section included recommendations to capture a time element within the tool as an additional field. The rationale for this additional element being that the time spent with a patient in addition to the qualitative aspects of patient encounter would fully capture the acuity level of the patient. All of the nurses indicated agreement with statement referring to ease of use and relevance to practice, leading to agreement score of 1.0

In the initial analysis of the data collected from the acuity tool, we ranked the patient acuity level by patient encounter type. Patients returning to the clinic for a first time visit post discharge from an inpatient stay ranked within the "High" acuity level. Factors including wound dressings > 5% Total Body Surface Area (TBSA), suture removal of >30 sutures and barriers to learning were indicative of high acuity. Patients returning to clinic for follow-up for an acute burn injury ranked within the "Moderate" acuity level, often requiring wound dressing care for 1-5% TBSA, a referral for child life involvement, OT/PT, and behavioral interventions for distress during provision of care. Patient encounters ranking in the "low" acuity level included follow-up appointments for Plastic Surgery, Orthopaedics, and Burn Scar evaluations. (Table 3) These rankings and descriptions of patient care needs and acuity were consistent with the anecsotal observations of the clinical staff.

Discussion

The scarcity of patient acuity tools within the ambulatory setting, and absence of such in a pediatric ambulatory burn clinic has led to nurse manager reliance on patient volume, number of providers, and wait times to determine nurse staffing levels.(7) With the increased complexity of the patient population in ambulatory clinics, these metrics do not accurately reflect the nursing process and care required to provide quality patient centered care.(15) In this project we sought to develop sought to develop a patient acuity tool that was objective, measurable and easy to use. The involvement of staff RN's in the development of the tool was critical to the success in usage, value and sustainability. Inclusion of categories including psycho-social indicators and the educational needs of patient and family, in addition to nursing interventions, ensured the capture of non-task oriented nursing care. Strong agreement from expert panel demonstrated evidence of a sound and measurable tool. Staff reported that the tool was easy to use and relevant to their practice. Concerns from the staff included an inability of the PedAAT to capture time spent with patients and an underestimation of the patient acuity level. Further refinement of the PEDAAT will be forthcoming based on feedback from results of the staff questionnaire.

The PEDAAT demonstrated a higher patient complexity and acuity with patients requiring care after an inpatient admission. Given shorter length of inpatient stays, these findings will support scheduling additional appointment time and increasing staff allocation for patients who require reinforcement of discharge education, review of the post-operative treatment regime and patient and family support. (10) This will ultimately improve both patient and staff satisfaction, while improving the delivery of care. Similar results for patients receiving care for an acute burn injury will support increasing the appointment time which will allow for patient education and family support.

This acuity tool was designed and evaluated for a specific setting however it may be able to be feasible to adapt it for use by nurse mangers in other specialty settings. However, such adaptation will require an understanding of the patient population and related nursing interventions. The PedATT was completed on paper and data was extracted by hand onto an excel spread sheet. This created challenges related to the time required. . Integration into the electronic medical record would potentially provide accurate data with minimal effort. This additional approach to determine nurse staffing, improvement of workload efficiencies, and potential improvement of patient and staff satisfaction will ultimately improving the delivery of care for this setting.

Acknowledgements

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Table 1. Expert Panel Ratings of PedAAT Items				
PedAAT	# of Items	Rated 1-2 1. NOT Representative 2. Representative with MAJOR revisions	Rated 3-4 3. Representative with MINOR revision 4. Representative	Percent Agreement
Representativeness	24	0	24	1.0
	# Items	Rated "No"	Rated "Yes"	
Clarity	24	2	22	0.92
Comprehensiveness	42	7	36	0.86
Category Definition	42	3	39	0.93

Table 2	PedAAT (Pediatric Ambulatory Acuity Tool) Questionnaire					
Question	DISAGREE	MODERATELY DISAGREE	NEUTRAL	MODERATLEY AGREE	AGREE	Comments
The PedAAT was easy to use.				25%	75%	• Not at first but once I got the hang of it, it was easy
The PedAAT was relevant to my practice.				25%	75%	• Difficult to capture all the things done in clinic
The categories in the PedAAT were easy to understand.					100%	
The indicators within each category were easy to understand.					100%	• Easy to understand; not sure if it allowed all situations to be captured
The indicators within each level (1-4) were representative of the care provided.		17%	33%		50%	• Hard to quantify some of the tasks performed in clinic
I would use the PedAAT in my daily practice.			50%		50%	• Would implement if needed, but if it does not demonstrate benefit, would not use

Table 3: Results PedAAT			
Encounter Type	Avg. Pt. Acuity Score	Std. Dev.	Acuity Level
Acute Burn: 1st f/u Outpatient Visit after Inpatient Admission	16.3	4.04	High
Reconstructive Burn: 1st Outpatient Visit after Inpatient Admission	15.5	0.70	High
Pre-Admission Testing (H&P)	13.5	2.87	Moderate
Acute Burn: New	12.2	2.04	Moderate
Acute Burn: f/u	11.0	1.60	Moderate
Plastics: New	10.0	n/a**	Low
Orthopaedics: f/u	9.7	2.56	Low
CLP/OMF*: New	9.5	0.70	Low
Plastics : f/u	9.3	1.73	Low
Orthopaedic: New	9.0	n/a**	Low
Burn Scar Evaluation	8.8	1.98	Low
CLP/OMF f/u	8.5	0.70	Low
Unscheduled visit (illness, infection)	8.0	n/a**	Low

*Cleft Lip & Palate/Oral Maxillary Facial Clinic

** Encounter Type n = 1

Figure 1
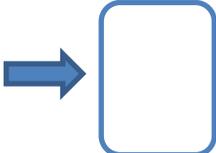**PedAAT (Pediatric Ambulatory Acuity Tool)**

Instructions

1. Circle Level that best represents the patient encounter for each category.
2. Place the Level Number at the end of the category.
3. Complete all six sections: Encounter Type, Nursing Intervention, Medication Reconciliation, Patient Education & Support, Patient Behavior, Psycho-Social Indicators
   a. If there are more than one choice that correlate to the patient encounter, choose the highest level that represents the clinic visit.
4. Tally the number from each category and place in the Total Acuity Score circle.

_____

A. Encounter Type: Circle One

LEVEL

1	2	3	4
• Plastics Follow-up • Burn Scar Evaluation • Orthopaedic Follow Up • CLP/OMF Follow Up • Nurse Only-All • Telephone Triage • Unscheduled Visit(ii.e.llness, immunization)	• Pre-Admission Testing • Scheduled IP Admit • Scheduled OP Surgery • Plastics-New • Orthopaedic-New • CLP/OMF-New • Acute Burn Follow-Up	• Acute Burn-New • Discharge Team Mtg. • Telephone Triage w/consultation-MD/ILP	• Acute Burn-1st OP visit post Inpatient discharge • Reconstructive Burn-1st OP visit post Inpatient discharge • Unscheduled Admission
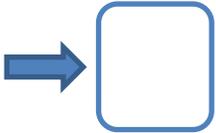
B. Nursing Intervention: Circle One

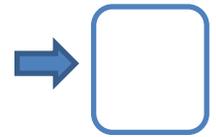| 1	2	3	4
• Nursing Assessment • Vital Signs • Height/Weight	• Obtain Cultures • Point of Care Testing (HCG, BS) • Wound Dressing-<1% (No Hands) • lMedication administration-PO,SC,IM • Suture removal-<10 Sutures • stent removal-1	• Wound dressing 1-5%/hand(s),>1 body part • Medium suture removal/stent down • Cast removal • Suture removal-10-30 sutures • Stent removal->2	• Tissue Expansion • Vac Dressing change/care • Wound dressing >5% • Splint application • Cast application • IV medication administration • Venipuncture for blood sample • PICC Line Care • Suture removal-> 30 sutures • Emergency Response

C. Medication Reconciliation: Circle One

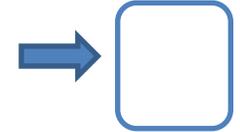| 1	2	3	4
• No Home Medications	• 1-3 Home Medications	• 4-5 Home Medications • Consultation with Pharmacy/Provider	• > 5 Home Medications
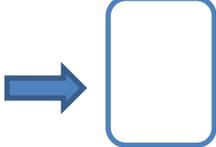
Turn to Page 2

D. Patient Education & Support: Circle One

| 1	2	3	4
•Routine Patient Education •Routine Discharge Instructions •Review of Pt. Medical Record prior to follow-up appt.	•Request for inter-professional involvement (Rehab, Child Life) •Reinforcement of patient education •Review of MR/prep for new patient •Medical Interpreter required	•Review of Lab results/consults •Consultation with Provider (NP/MD) •Consultation with SW, RN CM •Referrals-OT,PT,Nut •VNA Referral	•Extensive need for follow-up (telephone, appt.) •Extensive Patient Education (verbal, written, pictures, f/u call,home visit)

E. Patient Behavior: Circle One

1	2	3	4
•engaged in clinic visit;interest in procedure; asking questions; calm; playing	•Cautious behavior but willing to comply with procedure/exam; shows distress but calmed by caregiver/distracted by child life therapist •Administration of medication for anxiety	•Reluctance to accept treatment; uncoorperative; cries or is sullen & withdrawn; is able to be calmed and distracted with extra support	•Refusal of treatment; forceful crying; unconsolable;unable to calm with distraction by careiver or chlidlife therapist; treatment suspended

F. Psycho-Social Indicators: Circle One

1	2	3	4
•Adherance to treatment plan •Srong family/caregiver support	•Transportation coordination •Verbal support/reminders •Frequent missed/late to appts. •School performance/attendance issues •Housing/food/job insecurity	•Dept. Children & Families Involvement •Hx abuse,neglect +/or domestic violence •Mental health hx/dx. •Substance abuse (child/caretaker)	•International patient without external supports:PCP, community,family •Inpatient psychiatric admission (w/i 2 yrs.) •Feels unsafe at home •Non-adherance to trmt. plan (after sig. intervention) •Barriers to learning(cognitive, language, literacy,cultural,physical)
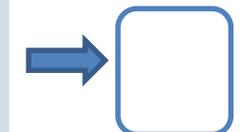
Acuity KEY

LEVEL 1: LOW :≤10 points   **LEVEL 3: HIGH**:15-20 points

LEVEL 2:Moderate: 11-15points   **LEVEL 4:COMPLEX**: ≥21 points

TOTAL ACUITY SCORE:
(A + B+ C + D + E + F)