# NextSTAT: A Low-Cost Lot Based Paging Solution to Request Urgent Help in the or Using Amazon AWS Cloud

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## Abstract

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## #1. NextSTAT: A Low-Cost Lot Based Paging Solution to Request Urgent Help in the or Using Amazon AWS Cloud§

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§Abstract submitted but not presented

**Mentor:** Nick Markin

**Program:** Anesthesiology

**Type:** Original Research

**Background:** Most hospitals have protocols to request helping hands via activation of a Rapid Response Team (RRT) or 'Anesthesia STAT' (AS!) event, where nearby anesthesiologists quickly go to the OR to provide assistance. Many hospitals still rely on antediluvian overhead analog speaker systems, which can be difficult or impossible to hear and are frequently scratchy, garbled, or otherwise unintelligible. Announcements are also prone to user error, hindrance due to lack of training, and missing/ambiguous information.

**Methods:** We used inexpensive ($49) touch-screen mini-computers (**Figure 1**) running custom software connected to Amazon AWS Cloud to create Call-for-Help! "buttons". When pressed, Amazon Web Services (AWS) Cloud handles the request, determines who is currently in roles that can provide help (QGenda), and sends targeted group text messages directly to provider's phones clearly stating the exact location requesting help. This general purpose intra-departmental paging system can also request equipment/supplies/ personnel in the OR. A novel Radio Frequency ID (RFID) badge system enables providers to enroll/unenroll from messages.

**Results:** Between October 2022 and July 2023 seven of our devices were deployed in three Post-Anesthesia Care Unit (PACU) locations at UNMC to facilitate PACU sign-out requests. The system delivered between ~500 and 1000 text messages per month with no



**Figure 1.** IoT ESP32-based touch-screen mini computers connected to Amazon AWS Cloud.

messaging or delivery failures. A follow-up survey was conducted to assess overall user satisfaction with the system (N=19), in which 74% of PACU nurses expected the devices would lead to improved communication when announcing Anesthesia STAT requests, and 90% expected the system would be useful in various hospital paging roles.

**Conclusion:** We present a reliable, flexible, inexpensive, largely scalable paging system to modernize AS! Announcements. A follow-up user satisfaction survey found that 90% of users thought the system would be useful in various hospital paging roles.

## #2. A Novel, In-House, Rapid Response Solution to a Critical Supply Crisis Affecting Hyperbaric Oxygen Therapy Centers Nationwide§

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§Abstract submitted but not presented

**Mentor:** Nick Markin

**Program:** Anesthesiology

**Type:** Original Research

**Background:** Hyperbaric Oxygen Therapy (HBOT) treatment centers like those at the University of Nebraska Medical Center (UNMC) are facilities that treat critically ill patients. Many patients who require HBOT are critically ill including sedated ICU patients and carbon monoxide poisoning victims, and require continuous IV therapy while receiving hyperbaric treatment. Monoplace HBOT centers throughout the nation currently rely on specialized IV tubing sets compatible with the HBOT chambers. Recently, the sole supplier of the specialized tubing has ceased production indefinitely leading to a critical supply shortage.

**Methods:** We rapidly developed an inexpensive adapter device that may be 3D printed using a flexible, "gasket-like" thermoplastic polyurethane (TPU), which allows the use of inexpensive, common off-the-shelf arterial line tubing with the HBOT chambers (**Figure 1**). These adapters cost $0.11 per unit to print and have unique design features "built-in" such as a flexible hinge. We provided our adapter design to monoplace HBOT facilities worldwide affected by the critical supply shortage as a royalty-free license, so affected facilities may download/print the design using their own 3D printers.

**Results:** The inexpensive solution developed resolved a supply crisis for UNMC allowing us to continue providing needed care to patients in the form of IV therapy, which is particularly necessary in critical care hyperbaric situations. Further, UNMC's adapter design was provided to hyperbaric facilities in the same critical supply shortage throughout the U.S.

**Conclusion:** We present a rapidly developed, inexpensive adapter device that enables use of inexpensive, common off-the-shelf, arterial

line tubing to replace specialized IV tubing. This 3D printed adapter help solve an acute hospital supply chain shortage.



**Figure 1.** IV tubing adapter attached to arterial line tubing.

## #4. High-Dose Reirradiation for Recurrent High-Grade Glioma

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**Mentor:** Chi Zhang

**Program:** Radiation Oncology

**Type:** Original Research

**Background:** High-grade gliomas (HGG) exhibit high rates of local recurrence despite multidisciplinary management. Optimal salvage management is unclear with reir-radiation representing a valuable option, though optimal radiation dosing has not been established.

**Methods:** We retrospectively reviewed 13 patients from 2018-2023 at our institution who underwent high-dose (≥59.4 Gy) reir-radiation for recurrent HGG. Patients were followed with brain MRIs and physical exams every 3 months. Dosimetric analysis of recurrences was completed. Kaplan-Meier estimates were used for survival data.

**Results:** From 2018 to 2023, 13 patients received high-dose reirradiation for recurrent HGG. Median age at reirradiation was 53.6 years (29.6 – 73.1 years), median interval time between radiotherapy courses was 33.7 months (19.5 – 202.6 months), median KPS was 90 (70-90), and median size of recurrence on MRI was 1.6 cm (0.4 – 5.0 cm). Concurrent systemic therapy was given in 11/13 (85%) patients. Median follow-up was 13.6 months where 12 patients exhibited progression and 10 patients died. The median progression-free survival and median overall survival were 14.8 months and 19.2 months, respectively (**Figure 1**). Areas of recurrence after reirradiation received a median minimum dose of 46.2 Gy (2.5 – 59.2 Gy) and median mean dose of 53.7 Gy (6.6 – 62.2 Gy). There were 4 (31%) patients who experienced late
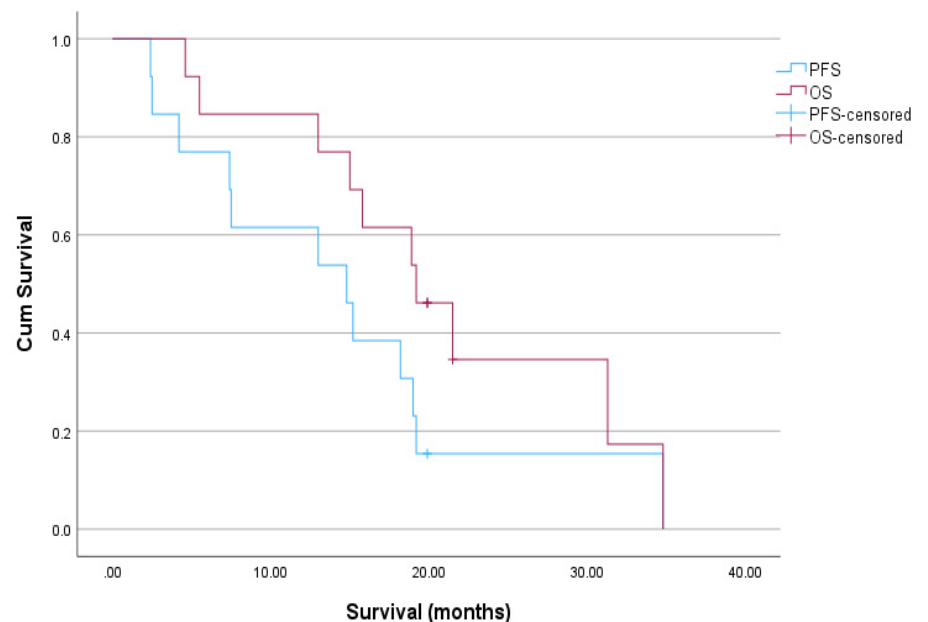


**Figure 1.** Kaplan-Meier Plots of Estimated Progression-Free Survival and Overall Survival.

grade 3-5 toxicity, including two grade 3 and one grade 4 radiation necrosis.

**Conclusion:** This selected patient population with recurrent HGG receiving high-dose reirradiation exhibited favorable survival outcomes with acceptable rates of late toxicity. A larger cohort is necessary to further evaluate high-dose reirradiation in this patient population.

## #5. Jenkins: An Anesthesia Intra-Op Voice Assistant to Improve Patient Outcomes and Situational Awareness in the OR§

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**Mentor:** Troy Wildes

**Program:** Anesthesiology

**Type:** Original Research

**Background:** Anesthetists perform competing duties in the operating room: 1) providing optimal medical through patient/procedure observation, monitoring vital signs and equipment, and administering medications, and 2) Electronic Health Record (EHR) documentation. This compromises safety, contributes to burnout, and decreases clinician performance.

**Methods:** We used Bluetooth headsets and cloud computing technologies to develop a voice assistant for anesthesiologists to perform routine OR tasks. Requests may be stated in different ways, e.g. "Hey Jenkins, what are the patient's allergies?" or "Hey Jenkins, allergies?" (**Figure 1**).

**Results:** Jenkins charts multiple medications with a single sentence and vets them for contraindications such as allergy, intolerance, and/or hepatic/renal clearance issues. It reports issues and provides prompts before charting drugs. For example, Jenkins alerts providers about malignant hyperthermia or dangerously high potassium. Jenkins can chart patient input / output volumes, intra-op events, and quick notes. Jenkins can do complex documentation such as intubation notes, details may be dictated in any order, and the user is prompted for missing details via closed-loop communication. Jenkins has also been integrated into our experimental hospital paging and emergency notification for



**Figure 1.** Example of chat dialogue with the Jenkins voice assistant.

Anesthesia request for help notifications, for example: "Jenkins, call for help!"

**Conclusion:** Jenkins will allow us to research hands-free voice assistant technology's role in intraoperative care and its potential to decrease attention diversion to the EHR and clinician workload, decrease time to critical interventions, support real-time decision support in time-sensitive environments, and prevent potential medical errors. Further, Jenkins improves charting time accuracy — necessary for effective data-to-care improvements through AI.

## #6. Community Hospital Psychiatric Length of Stay Compared to Academic Center Psychiatric Length of Stay

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**Mentor:** Wesley Zeger

**Program:** Emergency Medicine

**Type:** Original Research

**Background:** Psychiatric-related complaints account for a large amount of emergency department (ED) visits. There is a lack of inpatient and outpatient resources to meet patient needs resulting in prolonged lengths of stay (LOS). For patients with psychiatric complaints, we compared the effect of emergency psychiatric services (EPS) at an academic site (AS) on ED and system LOS to a community site (CS) utilizing tele-psychiatry.

**Methods:** Data was collected from the EPIC EMR from July 1, 2022, to January 31, 2023. Inclusion criteria consisted of age > 19, patients arrived with psychiatric complaints, and were discharged or transferred. ED LOS was defined as time from ED arrival to discharge or transfer. System LOS was defined as ED arrival to discharge or transfer from EPS. Statistical analysis

utilized descriptive statistics, ANOVA, and Chi-square.

**Results:** A total of 2405 AS patient visits and 447 CS visits were analyzed. The CS saw more caucasion patients (86.2% vs. 73.5%, P-value <0.001) and less housing insecurity patients (5.3% vs. 60.7%, P-value <0.001). Mean LOS from the CS, AS, and EPS were 799, 630, and 2273 minutes, respectively. No significant LOS difference between the CS and AS, but a significant difference in the LOS for both CS and AS compared to EPS patients.

**Conclusion:** We evaluated throughput for patients in the ED for psychiatric complaints. A higher proportion of patients had social determinants of health factors at the AS. ED LOS was similar between the AS and CS. Patients discharged by EPS had a higher LOS versus the CS.

## #7. Assessing the Accuracy of Weights With Stretcher Scales: A Novel Approach to Patient Safety

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**Mentor:** Abraham Campos

**Program:** Emergency Medicine - Emergency Medical Services

**Type:** Original Research

**Background:** Accurate weight estimation plays a pivotal role in prehospital and emergency medical care, particularly when determining medication dosages. Literature suggests a lack of consensus on standardized weight estimation tools, which poses significant challenges in prehospital settings. Our aim was to determine the accuracy of a prehospital Emergency Medical Services (EMS) scale, and self-reported weights in adults.

**Methods:** Participants were weighed on a hospital bed scale, prehospital EMS stretcher, and certified standing scale. Volunteers self-reported weights, age, and gender. Evaluations for accuracy were compared to the standing scale. Analysis evaluated for accuracy within 10% and 5%. Equivalence testing was performed on gender and self-reported weights.

**Results:** Study included 50 adults, 36 females (72%), 12 males (24%), and 2 non-reporting (4%). When comparing accuracy of EMS scale, 50/50 (100%) were within 10% and 49/50 (98%) within 5% of the standing scale. Furthermore, 50/50 (100%) of hospital bed scale weights were within a 10% and 5% difference, 49/50 (98%) of self-reported weights were within 10% and 45/50 (90%) within 5% of the standing scale. For women, the Test for Equivalence in self-reported weights was within the 90% confidence interval (-1.989, -0.855, p=0.0081). Men were within 90% confidence interval (-2.319, -1.215), but not the equivalence interval (-2.27, 2.27, p=0.0543).

**Conclusion:** Prehospital EMS and hospital scales demonstrated accuracy when compared to standing scale weights. Accuracy was highest when within a 10% difference. Self-reported weights also showed high levels of accuracy. Additional studies are needed to determine if scale weights can lead to more accurate dosing in weight dosed medications.

## #8. Iron Deficiency Anemia in Children With Short Bowel Syndrome

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**Mentor:** Ruben Quiros

**Program:** Pediatrics - Gastroenterology

**Type:** Original Research

**Background:** Short bowel syndrome (SBS) in children is defined as malabsorptive state, resulting from congenital malformations, significant small intestine surgical resection, or disease-associated loss of absorption. SBS is the leading cause of micronutrient deficiencies in children, especially iron deficiency (ID).

The aim of this study is to determine the prevalence and risk factors of iron deficiency in children with SBS undergoing intestinal rehabilitation.

**Methods:** Retrospective chart review of patients seen in IRP from Jan. 2017 to Dec. 2021. Variables of interest were compared between iron deficiency status groups separately by visit, but only patients with data available to have their iron deficiency status determined were included in these analyses. Associations between categorical variables were assessed using Chi-Square tests or Fisher's exact tests.

**Results:** A total of 193 new patients were seen during the period under review, only 94 patients met inclusion criteria. Necrotizing enterocolitis was the most common cause of SBS (43.6%). The prevalence of iron deficiency was 55.3%. Risk factors associated with iron deficiency in our study population included gestational age, small bowel length, TPN use, ileocecal valve resection, and large bowel resection.

**Conclusion:** Iron deficiency is the most common nutritional deficiency worldwide, accounting for over half of all anemia cases and the most common nutritional deficiency affecting children with short bowel syndrome undergoing intestinal rehabilitation. These data support the need for prompt monitoring, diagnosis, and aggressive treatment with intravenous iron to prevent effects of iron deficiency on growth and development of children with short gut syndrome.