



# How AI Can Help Hospitals Manage Patient Lengths of Stay

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*Vice President of Comprehensive Care Management, North Texas Division  
Baylor Scott & White Health*

**H**ospital stays that last too long can have a dramatically negative effect on both patients and the healthcare systems treating them. When people are kept from being discharged because of operational bottlenecks, their satisfaction with care is likely to decrease. The odds increase of their contracting a hospital-acquired condition that impacts quality of care when confinements stretch out, too. And under value-based care models, the hospital will experience higher in-patient costs without necessarily receiving greater reimbursement.

Many parties in hospitals have a stake in understanding the factors contributing to excessive lengths of stay (LOS). Clinical leadership wants to grasp how care teams are doing when it comes to completing pre-discharge consultations in a timely manner, for example. Care providers benefit from knowing which clinical, social or family interventions they need to prioritize for patient throughput. Operations staff wants to be able to target discharge protocols that need improvement, while the finance unit wants process inefficiencies identified and removed to avoid unnecessary costs.

Healthcare systems typically implement their own operational and clinical programs to gain control over LOS issues. But some find value in supplementing these efforts with artificial intelligence and predictive analytics technology. Baylor Scott & White Health, the largest not-for-profit healthcare system in Texas, is among them. “The challenge that we face executing length-of-stay reduction programs is to determine who can be discharged and how to prioritize the limited staff and resources that we have in order to help them prioritize and discharge patients,” said Nancy Temple, RN, MSN, CCM, Vice President of Comprehensive Care Management, North Texas Division.

### **Major LOS wins**

A time study conducted at one of Baylor’s smaller-to-mid-size hospitals revealed that about 900 hours of nursing care and case management were expended in multidisciplinary daily “huddles” devoted to LOS efforts. Restoring hours of clinician and administrative time back to on-the-floor patient care work would be a significant win.

Baylor has experienced such benefits since partnering with Pieces Tech, which uses natural language processing, predictive modeling, machine learning and AI in its Decision Sciences (DS) suite of cloud-based software to help healthcare systems optimize clinical and operational decisions. Its ReLOS (Reduction of LOS) solution delivers a greater than 95 percent positive predictive value in identifying specific barriers to patient discharge in the two Baylor hospitals where it has been deployed, and has saved more than 850 nursing review hours per year, per hospital.

In combination with its existing LOS efforts, Baylor’s use of ReLOS has led to a 3 to 10 percent decrease in patient stay time – the equivalent of 3,500 patient days if you annualize the reductions.



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**Ruben Amarasingham, MD**  
President and CEO  
Pieces Tech

Anyone at Baylor who wants to use the software – hospitalists, care managers, administrators – is provided access. Once hospital staff validated the software’s granular, clinically credible and actionable output, they were onboard with leveraging the tool to help support LOS goals. “It’s a team sport. It’s taken a lot of participation by all different disciplines to make it an effective tool,” Temple said.

### **AI on call**

Pieces’ DS solutions all take a five-step approach to improve outcomes in clinical decision-making, whether for reducing LOS, minimizing readmission risk, identifying early onset of sepsis or handling other issues. In fact, Baylor originally worked with Pieces on an effort to reduce hospital readmissions – an issue accounted for in the LOS solution, too. Pieces’ algorithms for calculating discharge readiness can pair with algorithms for calculating readmission risk: It’s important that patients not be released too soon since readmission within 30 days can lead to financial penalties for hospitals.

The first step is to identify the patient’s state. The software processes in real time both structured and unstructured data from electronic medical records systems (such as Epic, Allscripts, Cerner and McKesson solutions), lab findings and clinician notes. The AI system interprets the data just as a physician would.

This process sets the stage for determining the likelihood that a patient can leave the hospital within 24 hours, calculating potential discharge barriers and readmission risks, and setting priorities for ensuring the individual will be able to go home at the expected time. Its insights into patient status on the LOS journey, and predictions of adverse events that could disrupt timely discharge, are delivered to doctors, nurses and case managers in the activation step. These alerts can be sent directly to the EMR, smart phone apps or paging systems. The system follows through with continual monitoring of whether a particular patient, as well as the entire patient population, is progressing toward LOS goals while lowering readmission rates. Finally, it learns from every case to continue to improve its performance, taking into account each hospital’s local environment and practices.

Its “Clinician-in-the-Loop™” feature is vital to the machine learning process: Physicians and nurses employed by Pieces supervise the Pieces AI system, discovering issues that didn’t track as expected and finding areas for workflow improvement. “Human supervision of AI systems is needed in medicine right now, due to the highly nuanced nature of healthcare,” said Ruben Amarasingham, MD, president and CEO of the company.

### **A real-time healthcare assistant**

There are many examples of how AI technology can work as a supplement to the efforts hospitals already have underway to track patient LOS progress, offering a real-time assist in making sure that all the requirements for discharge and discharge planning are present.

ReLOS’ interpretation of documentation and notes reveals discharge barriers in order of importance, such as the need for symptoms to be resolved or a clinical process to take place. It can highlight, for instance, that a patient at a 90 percent discharge probability



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rating still needs a diagnostic test; scheduling the procedure as soon as possible can be the difference between meeting expected LOS goals or exceeding them by a day.

Or, it may read that a patient has refused a nasoduodenal feeding tube. Based on what it’s learned from similar past incidents at the hospital, it can predict and alert staff that the event is likely to affect the next appropriate movement in the treatment plan. “It understands that this person refused the tube and this is a secondary problem,” said Amarasingham. “It comes to a meta-level understanding – the way a clinician might think.”

Its sensitivity to the clinical nuances in the information it has digested also enables it to create plans for follow-up activities, such as noting outpatient treatment requirements.

The technology assesses not just clinical discharge barriers but social determinants of health, too. It may calculate that a homeless individual with a history of not complying with medication requirements has an 80 percent clinical readiness for discharge but also a 65 percent risk of readmission. That prediction can ensure that the appropriate social work team is brought into discharge planning to help avoid that outcome.

At Baylor, the tool also has been an asset when it comes to improving physician and care management documentation. Since ReLOS reads unstructured text as part of the process of discovering barriers for discharge, it’s important for care provider notes to be as comprehensive and cohesive as possible. “We’ve really learned to hone in on our documentation and provide cues for our hospitalists and care management teams so that Pieces gets the information it needs and that we can act upon,” Temple said.

“You can get constant improvements in a variety of areas as Pieces reviews information,” Amarasingham said. “If you could save even one day on LOS, that’s very significant.”



#### **About Pieces Technologies:**

Pieces Technologies, Inc. is a Dallas-based artificial intelligence solution provider on a mission to advance health at every decision. Pieces DS is a cloud-based clinical decision support platform that improves clinical and operational value by applying key algorithms throughout a patient’s journey, in real time. Fully integrated with the electronic medical record, Pieces DS leverages class-leading predictive modeling, natural language processing, machine learning, and artificial intelligence directly at the point of care. For more information about deploying Pieces DS at your health system, please visit [piecetechnology.com](http://piecetechnology.com) or follow @piecetechnology.