Aortic Stenosis Gradients and a Case for Quality Improvement

James M. Moses, MD, MPH

Paul Batalden,1 a world-renowned quality expert, is quoted to have said “Every system is perfectly designed to get the results it gets.” Implied from his quote is when different results are desired the processes of care that make up the system producing those results need to change. Too often in healthcare today we struggle with process deficiencies or inadequacies that negatively affect the care patients receive. Commonly, providers and other members of the multidisciplinary team do not have a framework or methodology to address those deficiencies. In academic settings, providers will often turn to research to identify solutions to address them. However, this approach comes at a cost. Research requires heavy resource investment and its measurement approach is unrealistic for improvement purposes. Research’s timeline is not conducive to addressing quality problems in a timely manner nor does it take into consideration the sustainability of solutions identified. Instead, a different approach is needed for improvement work. An approach that allows for a logical and practical method in identifying solutions that work in actual clinical settings and leads to the true north of realizing sustained improvement. If you will, the approach needed is one that works in vivo not in vitro.

See Article by Samad et al

In their article in this issue of Circulation: Cardiovascular Imaging, Samad et al2 have successfully demonstrated how continuous quality improvement (QI) can be applied to address an important clinical issue, namely the variation in echocardiographic determination of aortic stenosis (AS) gradients that leads to overtesting via cardiac catheterization. Using continuous quality improvement methodology, they were able to identify modifications in their echocardiography approach that improved the agreement between cath- and echo-derived mean AS gradients. The subsequent improvement in correlation leads to a decrease in unnecessary referrals for evaluation by invasive valve hemodynamics.

System of Profound Knowledge

QI is an applied science, meaning that it is a science applied in real settings with real people. Deming,3 who the authors reference in their article, was instrumental in bringing quality improvement not just to industry but to healthcare in the latter part of the 21st century. Deming3 spoke to a System of Profound Knowledge, which provides the foundational construct on which QI efforts work. There are four components to the System of Profound Knowledge:

1. Appreciation of the system
2. Understanding variation
3. Theory of knowledge
4. Psychology of change

The System of Profound Knowledge acknowledges that improvement will not be realized unless the system as a whole and each subcomponent of the system are well understood. With this understanding of the system, unnecessary variation can be identified and, therefore, addressed. In the effort to realize improvement, it is important to leverage a learning approach based on identifying the right solutions for a system by testing within that system. Notably, this means solutions are not known a priori but instead are best identified by testing in the real environment. Furthermore, improvement requires change. Leading change requires understanding how people react to changes in their environment and integrating methods that are proven to get people to buy into the changes being tested and implemented.

In this article, the authors demonstrated their Appreciation of the System by understanding the factors that drove the measurement difference in AS gradient assessments between echocardiography and cardiac catheterization. An important source of variation they came to understand was provider-based variation in approach to measurement of echo-based assessments of AS gradients. In addition, they found that peak Doppler information was not always accurately determined and communicated. The authors were then able to identify solutions directly aimed at addressing these causes of unnecessary variation. Specifically, they created a second review process through a buddy system as well as implemented a process for individual provider performance review with detailed feedback in a safe and protective environment. Importantly, they were mindful of how providers would react to change and derived a process that got their group bought into the problem by showing objective data collectively and reinforcing with each provider via the one-on-one feedback sessions. The end result was sustained improvement and a subsequent decrease in unnecessary testing that was clinically meaningful.
QI Measurement

One area in which the authors could embrace QI methodology even more is with the concept of using continuous data over time to inform the specific interventions they chose to implement. It is clear from their article they had a defined list of measures they felt were important to assess to prove the effectiveness of their interventions. However, by analyzing their data retrospectively in a pre/post design, they lost the opportunity to identify and refine solutions in a more timely manner. From a QI standpoint, this is an important point that needs emphasis. The role of measurement in quality improvement is not to prioritize evaluation of interventions over realizing improvement. Measurement for improvement is first and foremost. It is necessary to create feedback loops that assess the impact of changes made over time. By looking at data in real time throughout the course of their initiative, say on a monthly basis, solutions could have been identified, implemented, and refined earlier.

Commonly in QI we use outcome, process, and balancing measures as the measurement framework to provide continuous feedback on performance. Outcome measures can be true patient outcomes but more commonly they are a measure of the outcome of interest for the improvement effort. In this article, the outcome of interest was the correlation between cath and echo AS gradients. Process measures are learning measures to assess where variation is coming from within the system and to ensure that interventions implemented actually happen. Importantly in QI, there is also a need to assess for possible negative consequences on the system from the changes being implemented. Improvement in one part of the system may have a negative effect on another. Applying this measurement framework to the measures used in this article results in the following:

Outcome measures:
1. Percentage of cases who had <10 mmHg difference in mean gradients between cath and echo
2. Key patient outcome: percentage of patients referred for invasive valve hemodynamics

Process measures:
1. Percentage of studies reviewed by a second reviewer (aka and the buddy)
2. Percentage of studies that used nonstandard acoustic windows
3. Percentage of studies that used a Pedof probe to evaluate for the highest aortic valve Doppler information

Balancing measures:
1. Mean image acquisition time

Inherent Limitations of QI

When sharing QI results via publication, some limitations inherent to QI are important to consider. Are Samad et al.’s results generalizable? The simple answer is no. However, they can probably be reproduced elsewhere if a similar approach is taken in a similar environment. Results from QI efforts are, therefore, lessons to be learned. Neither edicts of truth nor absolute determinations of benefit. Results achieved are specific to the context from which they were derived. Therefore, the ability to reproduce results is based on how similar the context is in other settings and environments. Another limitation is not knowing the specific impact of each subcomponent of the interventions taken. Only the overall benefit of all the interventions together is known. Because sustained improvement is prioritized for determining the contribution of each specific element to the overall improvement gained, this is ok and is in fact encouraged. However, it remains a limitation of quality improvement methodology to be noted.

Conclusions

I commend the authors in their use of continuous quality improvement to meaningfully address a problem that had a negative impact on patients. Although health care has seen a lot of change since the seminal report To Err is Human was published by the IOM in 2000, the adoption of strategies that drive improvement has been slower than anticipated. Many question the analytic rigor and the science behind quality improvement. There still is a heavy bias toward assuming research and research-like methodologies provide the best mechanism for creating improvement in a proven and validated manner. However, given the difficulties in applying best practice consistently across clinical settings, using research to solve these quality issues is as stated earlier, simply not the way to go.

In addition to the authors, I want to commend this journal for moving ahead and accepting a QI article. Too many journals do not have an established forum for quality improvement work. There still is a lot of confusion in academia if quality improvement publications require institutional review board approval before submission. They do not by the way, per the US Department Health and Human Services. And, many journals do not have formal editorial staff who are familiar with and have expertise in QI. Of note, publication guidelines for quality improvement-related work do exist. The SQUIRE guidelines are a relevant and important tool, which can guide authors in how to structure their QI report while helping to provide a frame of reference for editorial staff in determining the quality of QI-related submissions.

Because health care continues to evolve and the need for improvement continues to be broadly recognized, more academic journals need to create accepted forums for quality improvement publication. Academic journals such as this one have an important role to play in creating this culture change as we try to better align the academic enterprise in medicine to one of improving care for real patients in real clinical settings. In other words, of realizing improvement in vivo not in vitro.

Disclosures

None.

References

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3. Moses


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