

What is with all the checklists?

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During the summer of 2010, I read the fascinating book “The Checklist Manifest” by Atul Gawande, a surgeon and professor at Harvard Medical School. Gawande is on a campaign to reduce the number of “avoidable failures” that plague the medical system. He notes that “(w)e have accumulated stupendous know-how. We have put it in the hands of some of the most highly trained, highly skilled, and hardworking people in our society. And, with it, they have indeed accomplished extraordinary things. Nonetheless, that know-how is often unmanageable. Avoidable failure is common and persistent, not to mention demoralizing and frustrating, across many fields – from medicine to finance, business to government.” His incredibly simple remedy is a checklist.

Checklists are very common in another complicated problem: flying an airplane. This wasn't always the case, though. In October 1935 the U.S. Army held a competition among airplane manufactures for the lucrative contract to build the next generation of long-range bombers. Unfortunately, the Boeing Model 299 crashed during the test flight, killing two of the five crew members. An investigation revealed that the pilot, Major Ployer P. Hill, who was the most experienced test pilot in the army, had made an error. The Model 299 was the most sophisticated plane designed up to that point. It could carry more bombs, fly faster and almost twice as far as its competitors. All of these features made the plane considerably more complex to fly and the pilot had forgotten to release the lock for the rudder controls. In the end this plane was deemed “too much airplane for one man to fly” by newspapers. The other US Army test pilots realized that in extremely complex situations it was too easy for someone, even someone with substantial experience to forget a simple step. So they devised a simple checklist written on 3x5 index cards. Using the checklist, US Army pilots went on to fly the Model 299 (later dubbed the “B-17 Bomber”) over 1.8 million miles without one accident. This plane helped the Allies gain a decisive aerial advantageous Germany in the Second World War.

In 2006, inspired by aviation, Gawande organized a WHO meeting in which the participants wrote a safe surgery checklist. Predictably, this simple solution was meet with skepticism by some and hostility by others. According to Gawande, “surgery has been regarded as an individual performance – the surgeon as virtuoso, like a concert pianist.” Virtuosos don't need checklists! However, Gawande and co-workers found that checklist had a remarkable effect on the eight hospitals in the 3-month pilot study in 2008. To quote Gawande

“Overall, in this group of nearly 4,000 patients, 435 would have been expected to develop serious complications based on our earlier observation data. But instead just 227 did. Using checklists had spared more than 150 people from harm – and 27 of them from death”.

So this lead me to think “if checklists are good enough for surgeons and pilots, why not graduate students and post-docs using NMR?” Modern NMR spectroscopy is complex. Even for experienced people, it is easy to miss a step.

These errors have consequences for every NMR user at KU. We estimate that between March 2009 and February 2010 avoidable failure caused more than 100 hours of downtime and cost the KU NMR lab more than \$1500. If something as simple as a checklist can help reduce downtime and expenses, then we would be foolish not to try. In the summer of 2010, the KU NMR lab introduced the first checklists into the lab. This checklist is a “DO-CONFIRM”-style checklist. We expect users to follow the steps to acquire a spectrum that we show them in the training. We hope that users will pause and use the checklist to confirm that they’ve carried out the steps correctly. Over the next few months we will monitor usage to assess the impact of the checklist. We anticipate that these checklists will have a modest, but measurable effect on the number of avoidable failures in the NMR lab.

Works Cited

Gawande, Atul. The Checklist Manifesto – How To Get Things Right. New York: Metropolitan Books, 2009.