

Workflow Organization in Pathology

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KEYWORDS

- Clinical pathology • Anatomic pathology • Genomics • Molecular diagnostics
- Modeling • Workflow organization

KEY POINTS

- An understanding of workflow science is critical for the practicing pathologist because it enables him or her to become an agent of positive change at an institutional level.
- Workflows can be sorted into three models: preindustrial, industrial, and postindustrial. Each workflow model has its advantages and disadvantages.
- The pathology workflow features a blend of preindustrial and industrial elements; the clinical pathology workflow currently features far more automation than the anatomic pathology workflow.
- Though laboratory information systems provide the electronic backbone on which the modern pathology department provides its services, these systems are often rigid and not interoperable.
- The lessons of the Toyota Production System are especially relevant to pathology because the pathology workflow arguably shares more similarities with a manufacturing workflow than any other workflow in medicine.

INTRODUCTION

Workflow organization in the pathology laboratory is not a topic that is well-understood, sometimes even by those who claim to be experts in the field. This largely because any given real-world production process is usually only observed one component at a time by stakeholders who are primarily concerned with that component (often in isolation). In surgical pathology, for instance, the histotechnologist, the slide custodian, and the pathologist all engage in the tracking of a very specific set of assets (ie, glass slides), yet their reasons for doing so may be quite different. As a result, their conclusions about the production process in which they operate and,

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perhaps more importantly, their reactions to the errors that arise within that system can be widely divergent.

Historically, in organizing its workflow, medicine has chosen to follow the lead of the manufacturing industry, deriving most of its quality control measures from practices that happened to be in vogue in the manufacturing sector at the time. A search (done June 2012) of PubMed using the search terms “quality management” and “laboratory” yielded 845 articles from 1966 to the present that focuses Total Quality Management to Six Sigma to Lean production on production management paradigms from. Although many (if not all) of these articles describe successful implementation of one production management paradigm or another in the health care sector, it is revealing that (1) health care providers still routinely encounter the same kinds of medical error that these production management paradigms are purported to solve, (2) the overarching culture of medicine has arguably remained largely unchanged, and (3) the mastercrafter-apprentice model of physician training has (at least for now) remained dominant. All of these observations have far-reaching implications that are discussed below.

Medicine is becoming more data-centric and patient-centric every passing day (ie, personalized medicine). As representatives of the medical discipline that generates and warehouses most of the average medical record’s structured data, pathologists have the opportunity to be the drivers of optimal workflow organization in a radically changing practice environment. To this end, however, all pathologists should have a basic understanding of the principles of workflow organization and production management and their modes of implementation. It is the authors’ hope that this article will provide such a foundation and inspire our colleagues to be champions of relentless quality improvement.

HISTORICAL OVERVIEW

The history of workflow organization can be divided into three distinct phases: preindustrial, industrial, and postindustrial.

Preindustrial Workflow

The preindustrial workflow is characterized by a high concentration of knowledge and skill in the hands of individual craftspeople who attain their position through time-intensive, idiosyncratic training programs (ie, apprentice to journeyman to master), usually under the direction of one master. Before the development and popularization of assembly line-style production methods in the mid-nineteenth to early twentieth century, this was the dominant workflow model in every industry in the world. In certain disciplines (notably, medicine) this remains the dominant model for training and professional licensure (ie, the medical student to resident to fellow to attending progression) even today.

In the preindustrial workflow, individual talent and attention to detail are major determinants of the resultant product. In addition, each master has a highly-customized workflow that may bear only superficial resemblance to the workflow of his or her peers. Finally, a master is also limited by the tools and raw materials he or she has on hand. It should, therefore, come as no surprise that the preindustrial workflow exhibits relatively high variability in the quality of and between masters. The preindustrial workflow’s focus on individual craftspeople leads to a curious phenomenon in which individual masters can build reputations that far overshadow the objective quality of their works. The world of classical music provides us with a fascinating example: violins by Antonio Stradivari and Giuseppe Guarneri (del Gesù) are widely

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