The efficiency movement of the early 20th century has long been seen as an infertile tangent to the story of American medicine and its modernization. Indeed, rationalized labor practices that started on the factory floor have found a difficult fit in the standard historical narrative describing this moment as one in which the medical profession concerned itself primarily with the elevation and consolidation of its authority. When the efficiency movement’s crossover into medicine has been acknowledged, it has been largely in regard to failed attempts by individual practitioners or smaller institutions to apply the principles of Frederick Winslow Taylor, efficiency’s great celebrity, to the work of resistant professionals.

But when efficiency met medicine in the early 20th century, their relationship was no mere dalliance, and its form often diverged sharply from the Taylorist vision. One of its key figures was the industrial efficiency expert Frank Gilbreth, though his techniques were considered by many to be simply publicity-seeking smoke and mirrors. In place of a stopwatch, Gilbreth employed still and motion-picture cameras in his measurements, and he expanded his visual efficiency services — dubbed “motion study” — from industrial settings to the medical profession in the early 1910s. When he gained access to hospitals, Gilbreth transformed their operating rooms into efficiency laboratories, covering all available surfaces with gridded lines, and requiring the masked surgeons and nurses to don numbered or lettered caps to aid in his analysis of their movements across the axes of the surgical space (see video, available with the full text of this article at NEJM.org).1

It was not accidental that Gilbreth’s initial forays into the hospital took place in the operating room. Surgeons saw in motion-based efficiency study the potential to reduce, through faster operating procedures, their patients’ exposure to what was at the time a leading cause of patient deaths: ether. Furthermore, they found in the process both the challenge and assurance that the outcome of a surgical intervention lay quite literally in their hands. Improving the efficiency and precision of the surgeon was as important as ensuring the quality of the tools he held. For these reasons, interest in efficiency was almost a professional requirement. Indeed, the American College of Surgeons (ACS) led the effort to incorporate efficiency measures into the standardization of U.S. hospitals. And it was early-century surgeons such as the outspoken Ernest Amory Codman of Massachusetts General Hospital who were invoked when efficiency came to the fore once again in the later decades of the 20th century.

So it was that one Monday morning in March 1915, two surgeons from the New York Hospital traveled to Gilbreth’s home to take part in a conference on surgical efficiency. The three men assembled in the Gilbreth family dining room, intending to make a motion picture. Drs. Eugene Pool and Frederick Bancroft were not unaware of Gilbreth’s reputation for self-aggrandizement, and they knew he hoped to gain publicity from the meeting. Nevertheless, at Gilbreth’s request and as his cameras recorded, they began to pantomime surgical procedures using his kitchen tools as implements — the first step in the motion-picture process that Gilbreth called cyclegraphy. Using a technique similar to one used by the earliest filmmakers to study physiology, Gilbreth attached small electric lamps to his subjects’ fingers and then captured their movements with long exposures. The result was a kinetic map of light traced over blurred, ghostly figures (see photo). Gilbreth would model these traces into three-dimensional dioramas and then coax them into more “efficient” vectors. All that remained was to teach this perfected motion to his subjects.

This project was guided by a logic of efficiency largely unfamiliar to us today: the notion
that one could establish the one
best way to improve a task not by
studying that task, as Taylor in-
sisted, but rather by studying
only the variable of motion. Gil-
breth considered motion to be
the essential and governing fea-
ture defining the efficiency of
work, and to measure it he
spurned the stopwatch in favor
of what he considered the far
more objective camera lens. In
the case of surgeons, the mo-
tions of greatest initial interest
to him were those considered
common to all procedures, in-
cluding the making of an inci-
sion or, better, the “tying of a
stitch,” a procedure that Gilbreth
asked to record at his conference
with Pool and Bancroft. To his
astonishment, the motions of
Pool’s pantomime were quite dif-
ferent from what he typically saw
when working with other test
subjects. Pool’s technique was al-
ready so efficient that the bulbs
attached to his fingers traced
what seemed to be an optimal
path through space as they ad-
vanced toward completion of the
final stitch.2

The archive suggests this was
a fruitful day for Pool and Ban-
croft, who would go on to co-
author an article on surgical sys-
tematization in which their debt
to Gilbreth is evident — particu-
larly in an illustration depicting
16 hands, each engaged in a
“manual signal system” devised
to augment the standard set of
more conventional surgical mo-
tions.3 And Gilbreth’s work con-
tinued to bear fruit in other
medical contexts, even as he fad-
ed from the history of the effi-
ciency movement. There were, of
course, other proponents of med-
ical efficiency — Codman, the ACS,
the Mayo brothers, and Robert
Dickinson, for example — but
Gilbreth’s work with motion and
images set the stage for increas-
ingly visual and aesthetic ap-
proaches. His legacy could be
glimpsed in later efficiency jour-
nals such as the Modern Hospital,
whose articles often considered
such visual elements as architec-
ture and object design to be essent-
tial engines of an efficient hospi-
tal. It could be seen in the 1920s
and 1930s, when the drive to-
ward streamlining in engineering
crossed into popular and medical
culture as a material and practi-
cal marker of effectiveness. And
it could be found in work with
evolving medical imaging tech-
nologies all the way up through
the recent advent of computer-
and robot-aided surgery.4

Understanding Gilbreth’s work
can help clarify what the look
and feel of medicine today — the
design of its material environ-
ment — owes to early enthusi-
asm for medical efficiency. Our
debt to that era has been ob-
scured in part by the fact that
outside surgery, there was no
clear, measurable relationship be-
tween efficiency and effectiveness
in medicine in the early 20th
century. Though medical practi-
tioners were relatively good at in-
vestigating disease, they were
still a bit hamstrung in their
abilities to effect treatments or
cures. There was thus no clear
sense of what exactly needed to
be made efficient.

Gilbreth and his contempo-
raries recognized this problem,
and they cast about for ways to
quantify the product of the hos-
pital. Gilbreth’s proposed prod-
ct, “happiness minutes,” did not
gain traction.5 Nor did any others,
really. Worries about what medi-
cine produced continued well
into the antimicrobial revolu-
tions of the 1930s and 1940s.
Soon, however, medical efficiency
became more about process than
product, and “efficient” became a
catch-all for faster, simpler, or even just good. Its original, creative sense had been lost.

Today, we trace medical efficiency more or less directly to Taylor, despite the fact that his personal interest in and impact on medicine were minimal. But there is good reason to remember Gilbreth and other medical efficiency actors of the same period. Though we may now hold a different perspective on what medicine does, remembering efficiency’s myriad forms and motivations encourages us to excavate, as Archie Cochrane proposed in the 1970s, the relationship between efficiency and effectiveness or, as we might put it today, the link between efficiency and the “goals of care.” These categories are neither self-evident nor fixed, and though we have come such a long way from Gilbreth’s showy visual examinations of efficiency that we have difficulty interpreting their significance, we might do well to make that original, creative question our own. What are the products of medicine?

Disclosure forms provided by the author are available with the full text of this article at NEJM.org.

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PERSPECTIVE

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