Bigger Needle Smaller Number

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This is going to be a short post because the last one about EHR front-ends was about 3 times longer than I had originally planned for it to be.

A while ago I came across this wonderful tweetorial on the history of needle gauges. It is a summary of an article entitled “The story of the gauge” by Pöll. [1] Pöll traces the lineage of the Birmingham Wire Gauge (BWG) system (the measurement system we use to describe the diameter of the hypodermic needles). Its an interesting story that lays out how we ended up using a seemingly counterintuitive system developed in the 19th century to communicate the size of needles we want to use.

Wire Gauge Illustration by P.S. Foresman

As a med student we are taught to ask for “two-large bore” IVs when a patient is at risk of needing a large amount of blood or fluid transfused. My notes say this is 16 gauge or larger (I’ve seen 18 or larger as well). The “larger” part can be confusing when it comes to needle gauges. [2] This is because larger needle diameters actually have smaller gauge numbers.

The reason for this comes down to development of the BWG. It was developed to measure the thinness of drawn wire. Wire is drawn (or made thinner) by pulling metal through dies (holes in metal templates). You make the wire thinning by repeatedly drawing it through smaller holes. The numbering of these holes is the gauge. Thus the larger the gauge the thinner the wire (or needle).

Reading through the history of how the BWG came to be the standard for wire (and needle) gauging is a good reminder that standards and nomenclature don’t emerge linearly in relation to the technology being used. I think this is especially true in healthcare where technology often gets ported after being developed elsewhere.

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P.S. There are some really cool physical properties that interplay with gauge size. One has to do with intermolecular forces (van Der Waals forces), which lead to a neat relationship between the gauge sizes, each gauge is about 11% thinner than preceding gauge. [1] The second has to do with the flow rate through a needle which is related to the quadratic power of the radius of a needle. [2]

Bibliography

1. Pöll, J.S., The story of the gauge. Anaesthesia, 1999. **54**(6): p. 575-581.
2. Verhoeff, K., et al., Ensuring adequate vascular access in patients with major trauma: a quality improvement initiative. BMJ Open Quality, 2018. **7**(1): p. e000090.

