A tremendous variety of medical devices is available to surgeons today. In this environment, a surgeon’s ease in using a device version that he has never previously used has important implications for productivity and quality. Further, high device variety increases the time gap between repeat uses of any particular device version by a surgeon. This can result in forgetting over time of device-version-specific knowledge. The impact of forgetting over time at the level of specific tasks has not been examined previously. We use a unique, hand-collected dataset to examine learning and forgetting in hip replacement surgery as a function of a surgeon’s experience with specific surgical device versions and the time between their repeat uses. We also develop a generalizable method to correct for the left-censoring of device-version-specific experience variables that is a common problem in highly granular experience data, using Maximum Simulated Likelihood Estimation (MSLE) with simulation over unobservables conditional on observables. Even for experienced surgeons, the first use of certain device versions can result in about a 32.4% increase in surgery duration, hurting quality and productivity. Also, with the passage of time, surgeons forget knowledge gained about the use of certain devices. We discuss implications for practice.