Despite continued advances in cochlear implantation, individual outcomes remain highly variable. Our ability to predict how much benefit an individual will receive from a cochlear implant (CI) is limited, and even monitoring CI outcome can be challenging in some cases. For example, children who are born deaf are typically implanted before the age of one, several years before they can complete behavioural tests of speech understanding; during the intervening time, clinicians have little objective information on which to base the allocation of rehabilitation resources or to optimise device programming. In this talk, I will describe ongoing efforts at the Nottingham Hearing BRU to develop novel tools to help predict and monitor CI outcome based on an emerging optical brain-imaging technique, functional near-infrared spectroscopy (fNIRS). Unlike most standard neuroimaging techniques, which lack compatibility with CIs, fNIRS is fully CI-compatible, as well as being well suited for use with patients of all ages and in clinical settings. In adults, we have shown that fNIRS imaging performed before implantation can help predict future clinical outcome. In studies of simulated CI listening, we have shown that fNIRS is capable of measuring distributed patterns of brain activity that may encode both speech intelligibility and listening effort. Thus, fNIRS holds promise as a flexible tool that could in future be used to inform prognosis and optimise CI benefit.