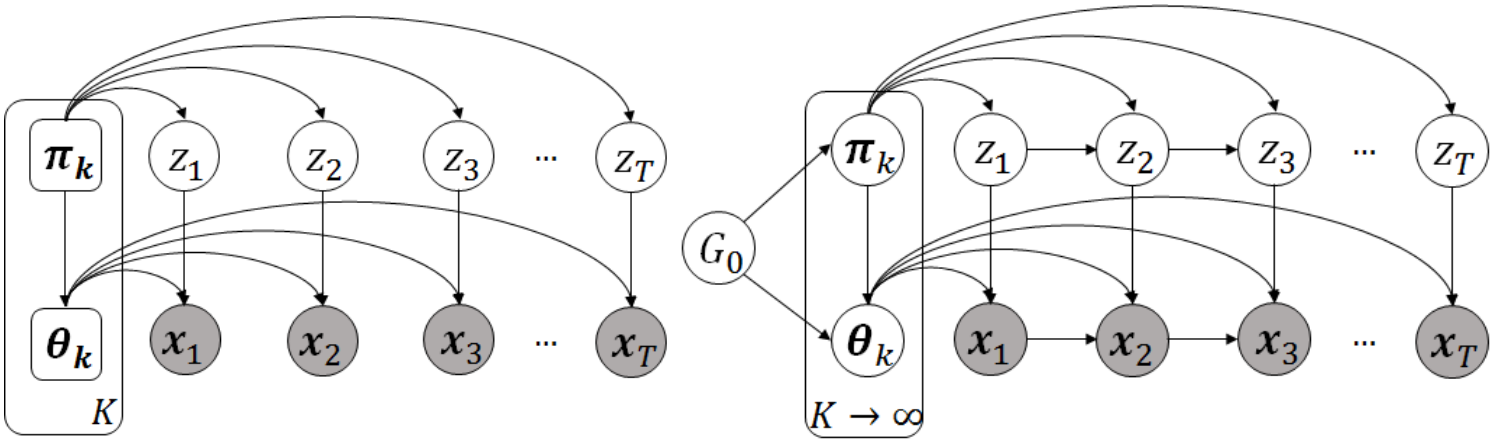
Supplementary Material

Table S1:
Clinimetric test protocols, assumptions and commonly encountered protocol violations in the Smartphone-PD project data used to test the quality control framework proposed in this study.

Test	Protocol	Protocol violations	Hand-labelling protocol
Voice	Place the phone up to your ear as if making a normal phone call. Take a deep breath, and say "aaah" for as long as you can, at a steady volume and pitch.	1. User interactions with the smartphone including taking a phone call, texting or playing a game during test. 2. User performs test in loud environment. 3. Non-sustained vowel phonation activities including coughing, reading out the instructions on the display, talking to another person, during test.	(1) Vowel sound segments are marked as adherence (2) Anything else is marked as non-adherence
Balance	Place the phone in your pocket. When the buzzer vibrates, stand up straight unaided.	1. User interactions with the smartphone including taking a phone call, texting or playing a game during test. 2. User is jumping or falling during the test.	(1) Where there is uncertainty in the user's activity, a non-adherence label is applied (2) Buzzer is labelled as non-adherence (3) Where an interval is confounded with the buzzer, a non-adherence label is given to that interval (4) Where an interval is confounded with an orientation change of the smartphone and the data is otherwise ambiguous, a non-adherence label is given to that interval
Walking	Stand up and place the phone in your pocket. When the buzzer vibrates, walk forward 20 yards; then turn around and walk back.	1. User interactions with the smartphone including taking a phone call, texting or playing a game during test. 2. Non-walking activities including jumping, falling or standing still. 3. User encounters obstacles during walking which interfere with normal walking.	(1) Where there is uncertainty in the user's activity, a non-adherence label is applied (2) Buzzer is labelled as non-adherence (3) Where an interval is confounded with the buzzer, a non-adherence label is given to that interval (4) Where an interval is confounded with an orientation change of the smartphone and the data is otherwise ambiguous, a non-adherence label is given to that interval (5) A turn is labelled as adherence



(a) (b)

Figure S1: Probabilistic graphical models for (a) Gaussian mixture model (GMM) and (b) nonparametric switching autoregressive (AR) model. The GMM component parameters θ_k are the mean and the variance of data associated with component k. By contrast, the component parameters θ_k for the switching AR consist of the AR coefficients $A_1^k, \ldots, A_r^k$ and the AR error parameters μ_k and σ_k. Parameter π_k denotes the mixing coefficients and the transition matrix for the GMM and the switching AR, respectively. In the parametric GMM π_k and θ_k are fixed. In the nonparametric switching AR π_k and θ_k are modeled with an HDP prior, where $G = \{G_1, \ldots, G_{K^+}\} \sim \text{HDP}(\alpha, \gamma, \theta_0)$. Hyperparameter θ_0 denotes the conjugate prior over the $A's$, the $\mu's$ and the $\sigma's$. See main text for further description of the HDP and its concentration parameters α and γ.