**Appendix Section 1**

*Process Used to Link ICD-9 to ICD-10 Diagnosis Codes Using the GEMS Reimbursement Mappings*

We used the 2016 reimbursement mappings created from the General Equivalence Mappings (GEMs) system to identify a single ICD-9 diagnosis code as the recommended principal diagnosis for each ICD-10 code, then used these matches to map the weights from our patched ICD-9 algorithm onto ICD-10 codes. The reimbursement mappings were developed by the Centers for Medicare and Medicaid Services (2016) for hospitals to backward-map the new ICD-10 diagnosis codes to the old ICD-9 codes in their legacy systems to support health services reimbursement during the transition from ICD-9 to ICD-10.

*Process Used to Simulate a Dataset of ED Visits with 2016 ICD-10 Primary Discharge Diagnosis Codes*

We simulated a national dataset of ED visits coded with ICD-10 primary discharge diagnosis codes by applying the 2016 GEMS reimbursement mappings to the 2012 NEDS data using real ED visits with non-missing ICD-9 codes that mapped to ICD-10 codes (96% of the sample). Many ED visits, however, mapped to multiple ICD-10 codes because there are five times as many ICD-10 codes as there are ICD-9 codes (reflecting a more granular level of clinical information in ICD-10). To prevent our simulated dataset from becoming a simple multiplicative function of the relationship between ICD-9 and ICD-10 codes in the GEMS reimbursement mappings, we randomly selected only one matching ICD-10 code for each ED visit (using random numbers on the uniform distribution). We did this when the ICD-9 primary discharge diagnosis code on the ED visit mapped to multiple such ICD-10 codes. Thus, at the end of the process, our simulated dataset of ED visits coded with ICD-10 diagnoses contained the same number of visits as the original dataset with ICD-9 codes that we began with. In essence, we replaced the ICD-9 code on each ED visit one-for-one with a single representative ICD-10 code. As a result, we were able to use the 2012 NEDS to generate weighted national estimates for our simulated ICD-10 coded ED visits.