Length of Stay Calculation

The Length of Stay (LOS) report in LTC Trend Tracker calculates the median LOS for all new admissions from a hospital. As well as the percentage of new admissions who have stays of 7 days or fewer, 14 days or fewer, 20 days or fewer and 45 days or fewer. The LOS is based on MDS 3.0 data. This document describes how LOS is calculated and how users can interpret their results. LOS is not a quality measure but a measure of resource use that needs to be interpreted in the context of other measures of quality in the post-acute care setting (such as rehospitalization rates, discharge to community, improvement in function, etc.).

Data Definitions

Length of Stay (LOS): LOS is calculated for new admissions to a nursing center from a hospital. New admissions are defined as any admission from a hospital with no assessments in the 100 days prior to the admission assessment. Each person's LOS is calculated based on the number of days between their admission and discharge from the Center. If they are not discharged from the center within 120 days from admission they are assigned a LOS of 120 days no matter how long they stay past 120 days. The time frame for the measure is 12 months rolling and updated quarterly.

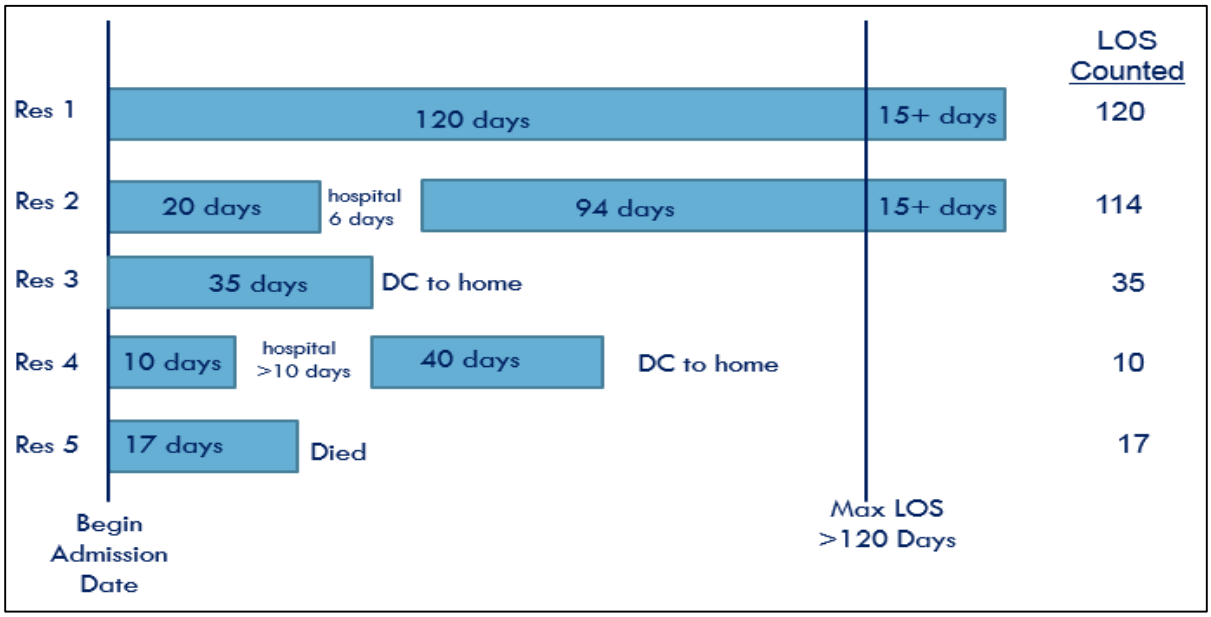
When an individual has an interruption in service that is **10 days or less**, their LOS from their subsequent readmission to the SNF will be added to their prior admission's LOS. (See Figure 1's Res #2 example.)

- For example, a person is admitted to a SNF on March 1st from a hospital and is sent back to the hospital on March 20th. She remains in the hospital for 6 days and is readmitted back to the SNF on March 16th and remains in the SNF for another 92 days. Her LOS would count as 114 days (10 days + 94 days).

When an individual has an interruption in service that is **greater** than 10 days; their LOS ends on the day of discharge to the hospital. Any subsequent admission to the SNF is not counted unless it meets the criteria for a new admission as stated above. (See Figure 1's Res #4 example.)

- For example, a person is admitted to a SNF on March 1st from a hospital and is sent back to the hospital on March 10th. He remains in the hospital for 12 days and is readmitted back to the SNF on March 22th and remains in the SNF for another 40 days. He would have one LOS of 10 days but his subsequent 40-day stay in a SNF would not be counted.

Figure 1. Depicts different patient scenarios as to how a patients LOS is calculated using the above rules.



Population Included (i.e., Denominator): All individuals (regardless of payer status) who are admitted to a SNF from a hospital but were **NOT** in a SNF during the prior 100 days are included. All deaths are excluded from the median LOS calculation and from the four other metrics only when the death occurs before the cut point (e.g. deaths occurring on day 16 are included in the 7 and 14 day metric but not in the 20 and 45 days or fewer metrics).

The denominator is based on admission from any hospital and is determined using information from MDS. There must be at least 30 admissions to the center in a 12 month period. Individuals with missing data from MDS admission metrics are *excluded*. Individuals that have a prior stay (in any) nursing home for any reason are *excluded*. This allows LOS to capture new admissions from a hospital that were not in a Skilled Nursing Center prior to the hospital stay.

Median LOS (Actual): Median is the middle numerical value separating all of the individuals into two halves when ranking (high to low) each admission to a Center by their LOS value. One half of all the residents have a LOS value greater than the median and the other half of the individuals have a LOS value less than the median. The *median* is used rather than the mean (or average) because the LOS average can be misleading by having a few residents with very long LOS.

For example, assume a Center has 5 admissions, each with LOS of 5, 10, 15, 20 and 100 days respectively. The median will be 15 days (the value where half resident have lower and half have higher values), while the average (or mean) will be 30 days [i.e., (5+10+15+20+100)/5]. The mean (or average) of 30 days is higher than the LOS for 4 of the 5 residents while the median is the exact mid-point.

Median LOS in LTC Trend Tracker Report includes:

- Actual Median LOS
- Expected Median LOS (the method to calculate is described below)
- Risk Adjusted Median LOS (method to calculate is described below)

Percent Staying 7, 14, 20 or 45 Days or Fewer Days Metric (Actual): Each metric [staying 7, 14, 20, and 45 days or fewer] is calculated using the following approach. The percentage staying 14 days or fewer is calculated by dividing the number of individuals with LOS 14 days or fewer by the total number of admissions from a hospital that did not have a prior stay in a SNF within the 100 days of admission (see denominator definition). This description is identical for the other three metrics (staying 7, 14, 20 and 45 days or fewer).

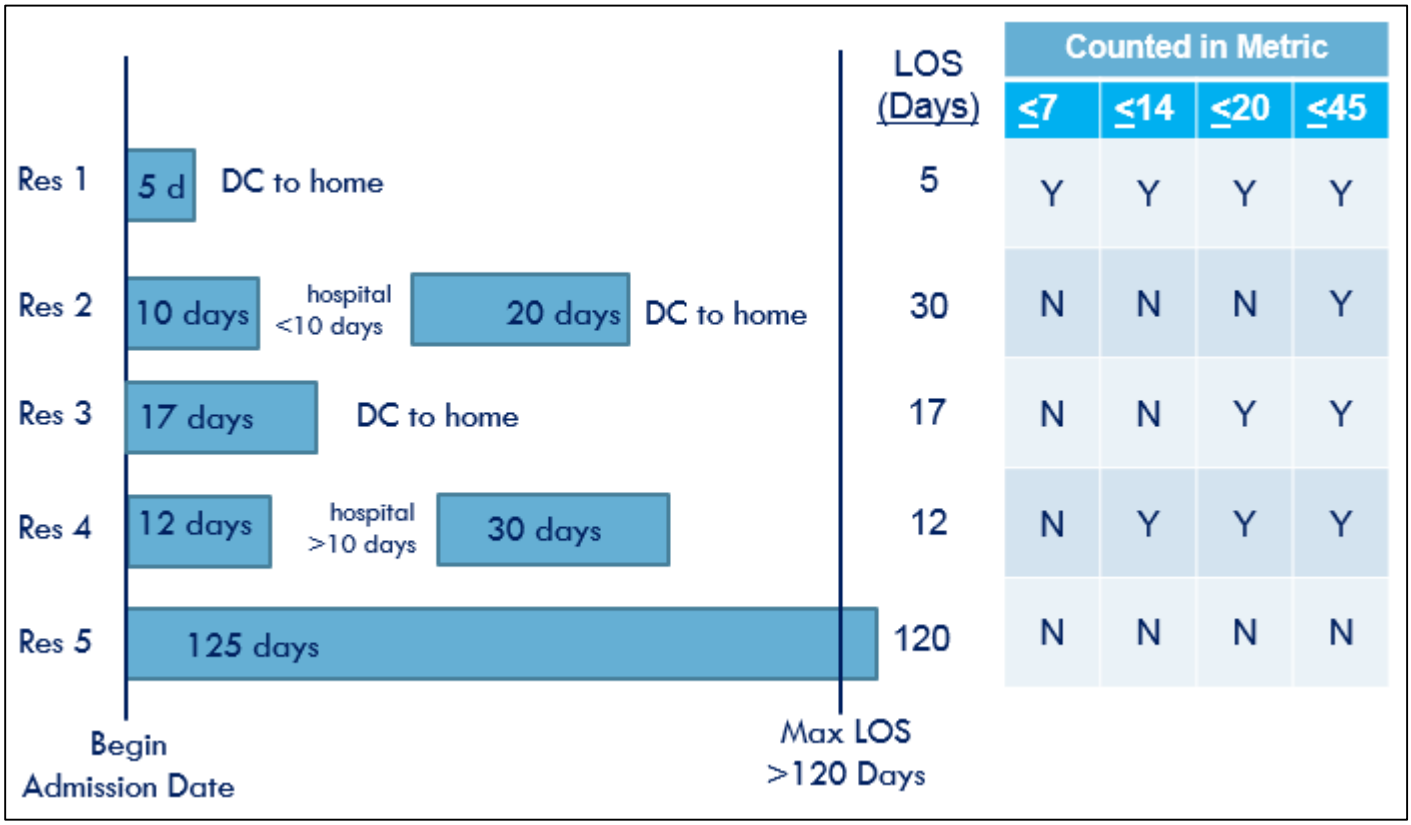
Numerator:	*number of individuals with a LOS of 14 days or fewer*
Denominator:	*all residents (regardless of payer status) admitted from an acute hospital to a center over the prior 12 months and who did not have a prior stay in a nursing center for the prior 100 days; and did not die before 14 days following admission.*

Figure 2 depicts different five different scenarios and how each is counted in the staying fewer than X days metrics. Res #1 who stays for 5 days will be counted in the numerator for all four metrics (staying 7, 14, 20 or 45 or fewer days). Whereas Res #5 is not counted in the numerator for any of the metrics. Res #4 stays 12 days is hospitalized for more than 10 days and returns for 30 days. Because they were hospitalized for more than 10 days, only the LOS for the first admission is counted. Therefore this person is counted in the 14, 20 and 45 or fewer days metrics.

How is this calculated for an entire center? So for example, let's say a single center (Brook Creek) admitted 225 individuals from the area hospitals in the prior 12 months, but 25 of them had a prior nursing home stay within 100 days of admission. Therefore, the denominator is 200 (i.e., 225-25 = 200) since we exclude those who had a prior nursing home stay. If 100 of these individuals had a LOS less than 14 days, the numerator would be 100. Therefore, the center's actual

% LOS 14 days or fewer would be 50% (i.e., 100 ÷ 200 = 50%). The Actual LOS does not adjust for any of the clinical characteristics of the individuals in the center.

***Figure 2**. Example of who is included in each % staying fewer than X days metrics.*



LOS (Days)	Counted in Metric ≤7	≤14	≤20	≤45
5	Y	Y	Y	Y
30	N	N	N	Y
17	N	N	Y	Y
12	N	Y	Y	Y
120	N	N	N	N

Expected LOS: We a use logistic regression (a statistical method that can adjust for multiple clinical characteristics [e.g., age and gender] at the same time) to calculate the expected LOS for each admission. Logistic regression uses all the clinical characteristics listed in the table on page 6 to calculate the expected LOS for each resident based on the LOS for patients with a similar profile of clinical characteristics across the country.

For example, hypothetically, women who are older than 65, with dementia, diabetes, and on oxygen may have an average LOS of 35 days. Meanwhile, men who are 65 or younger who needs two person assistance with ADLs and have a history of heart failure may have an average LOS of 25 days.

Logistic regression calculates the adjustment in LOS for each resident based on their risk profile and then aggregates each individual's risk to create an expected LOS rate for the center based on the profiles of all the residents in the center.

Example – ***If Brook Creek SNF, has just two residents, each with the clinical characteristics described above (a woman older than 65 with an average LOS of 35 days and a man younger than 65 with average LOS of 25 days), the center's expected LOS would be 30 days [(35 + 25) ÷ 2] = 30 days***.

Risk-Adjusted LOS: To obtain the risk-adjusted LOS for any Center, the Center's actual LOS rate is divided by the Center's mean expected LOS (expected rate) which is then multiplied by the national observed LOS.

$$\frac{Actual\ Rate}{Expected\ Rate}\ x\ National\ Observed\ Rate = Risk\ Adjusted\ Rate$$

National Observed Rate used in the formula is the national median LOS based on the LOS for all individuals in SNF. The national median LOS is chosen by rank ordering the LOS for all new SNF admissions in the nation (regardless of payer status and what SNF they are located) and selecting the median value – see definition for how to calculate median) For example, assume there are only three centers in the country (Centers #1, #2, and #3) each with 2, 4 and 5 admissions respectively (11 total admissions).Table 1 depicts how the national median LOS is calculated.

Table 1. Example of how National Observed Rate is calculate.

	Total Admissions	LOS for each admission	All admissions merged and then rank ordered LOS lowest to highest to find median value
Center #1	2	10, 20	5, 10, 12, 15, 20, **24**, 25, 35, 48, 60, 72
Center #2	4	5, 15, 25,35	
Center #3	5	12, 24, 48,60,72	

The national observed median LOS would be 24 based on ordering the LOS and choosing the middle value.

For the four other LOS metrics (% of residents staying 7 days, 14 days, 20 days or 45 days or fewer) the national average of the % staying 7, 14, 20 or 45 days or fewer is used when calculating a Center's risk adjusted rates for these four metrics (See Table 2. for example calculation). For example, assume there are only four centers in the country (Centers A, B, C and D) each with 50, 100, 200 and 300 admissions respectively (650 total admissions) and the number of admissions staying less than 7 days in each center were 25, 50, 100, 150 respectively (325 total). Table 2 shows how the total admissions are summed and the total number of admissions staying 7 or fewer days is summed to calculate the national average of 50% of admissions staying 7 days or fewer. The value of 50% is used in the risk adjustment model.

Table 2. Example of National average used in the risk adjusted model for % staying 7, 14, 20 or 45 days or fewer.

	Total Admissions	# of admissions staying 7 days or fewer
Center #A	50	25
Center #B	100	50
Center #C	200	100
Center #D	300	150
Total	650	325

The national % staying & days or fewer is 325/650 or 50% which is the value used in the risk adjusted model.

Data Source: MDS 3.0 data submitted to CMS over a 12 month period, using all admission assessments (either 5-day SNF PPS or the 14-day OBRA Admission assessment) for the start date and the discharge assessment or other MDS assessments (e.g. quarterly or annual MDS assessment) for the end date. A completion rate of at least 95% or higher for the MDS discharge assessment is required for the data to be reported (see data completeness below).

Date of Admission: From MDS using 2 variables: A1600 (entry date) and A0310F=01 (indicating 'entry tracking records'). In addition, a non-admission assessment (i.e., A0310F=01) is allowed to start a 'new admission' if the 100-day criteria is met AND 1) the assessment is not a quarterly or annual assessment; the assessment is not labeled a discharge assessment in A0310F (10, 11) but an admission assessment in A0310B (06); the assessment is not labeled a discharge assessment in A0310F (10, 11) but an admission assessment in A0310B (07) when A0310A=99.

Date of Discharge: MDS item A2000 (discharge date) variable on the MDS discharge assessment.

Admission from The Hospital: MDS item A1800 when option "03. Acute hospital" is indicated.

Death: Captured from the MDS assessment's target date when A03210f=12 or A2100=08.

How to Interpret Your Actual vs Expected LOS

When your actual LOS rate is ***equal*** to your expected rate, that means you had the same percentage of residents with a LOS that was expected based on your case mix compared to the rest of the nation.

When your actual LOS rate is ***greater*** than your expected rate, which means you had longer LOS rates than expected based on your case mix compared to the rest of the nation.

When your actual LOS rate is ***less*** than your expected rate, which means you had shorter LOS rates than expected based on your case mix compared to the rest of the nation

Data Completeness: AHCA checks if follow-up MDS data is available on all admissions. If MDS discharge assessment and discharge status data is routinely missing in a center, we do not know how accurate their LOS results will be. The completeness rate is calculated as the percentage of admission assessments that have either a discharge assessment or a quarterly (or annual or change of status) assessment within 120 days of admission. If a particular admission is missing a discharge or quarterly assessment within 120 days, the record is considered incomplete and dropped. Overall, the average data completeness rate is 98.5%. The adjusted LOS is not reported if the completeness rate is less than 95%, since the adjusted rate may not be sufficiently accurate or stable for those centers.

Clinical Characteristics Used in Risk Adjustment

The Risk Adjustment includes between 61 and 72 different clinical variables depending on the metric divided into six domains: demographic, functional status, prognosis, clinical conditions, clinical treatments, and clinical diagnoses (see table below). We only used information available from the MDS admission or PPS assessment that fell within a certain timeframe and came on or before the first discharge (excluding a discharge due to death). For LOS within 7 days, the assessments had to occur within 7 days of admission (whether or not the resident's LOS was within 7 days). For LOS within 14 days, they had to come within 14 days, and for all other LOS models the assessment had to come within 20 days of admission. For residents that had an eligible assessment but may have been missing on a particular characteristic, a value for the characteristic was imputed based on the center average for that characteristic. In the very rare event that a characteristic was missing for all persons in a particular Center, the national average for that characteristic was assigned to each individual with missing information.

Initially, we calculated the relationship with many more clinical characteristics with LOS than listed in the table below. Those that had either an increased or decreased relationship were included in the final logistic regression model. Those characteristics that continued to have an independent association in the models were retained, while those that no longer had a statistical relationship were dropped. The final list of clinical characteristics, along with the corresponding MDS item, is shown in the table below.

Table – Clinical Characteristics Included in the Final LOS Models

Variable Description (with MDS item #)		<=7 days	<=14 days	<=20 days	<=45 days	Median LOS
DEMOGRAPHICS	Age	x	x	x	x	x
	Gender (A0800)		x	x	x	
	Marital Status (A1200)	x	x	x	x	x
FUNCTIONAL STATUS	Vision: grouped as: adequate vs. impaired vs. moderately/highly/severely impaired (B1000)	x	x	x	x	x
	Hearing: grouped as adequate vs. impaired vs. moderately/highly/severely impaired (B0200)	x	x	x	x	
	Makes self-understood: grouped as Understood, usually understood, sometimes/rarely/never understood (B0700)		x	x	x	x
	Ability to understand: grouped as understands, usually understands, sometimes/rarely/never understands (B0800)	x	x	x	x	x
	Cognitive impairment based on BIMS scale grouped as– light, mediate, and severe. [1] (C0500, C1000)	x	x	x	x	x
	Any Sign/Symptoms of Delirium (C1300A-D)	x	x	x		x
	Major Depression (combined into a single item) According to CMS quality measure definition using MDS items (D0200A2, B2; D0300; D0500A2, B2; D0600)	x	x	x	x	x
	Behavior Codes (combined into a single item) for any yes on: Hallucination (E0100a) Delusion (E0100b) Physical Behavior (E0200a) Verbal Behavior (E0200b) Other Behavior (E0300c)	x	x		x	x
	Any Rejection of Care (E0800)	x	x	x	x	x
	Activities (each coded separately)[2]					
	Bed mobility G0110A1	x	x	x	x	x
	Transfer G0110B1	x	x	x	x	x

Variable Description (with MDS item #)		<=7 days	<=14 days	<=20 days	<=45 days	Median LOS
	Walk in Corridor G0110D1	x	x	x	x	x
	Locomotion G0110E1	x	x	x	x	x
	Eating G0110H1	x	x	x	x	x
	Dressing G0110G1	x	x	x	x	x
	Toileting G0110I1	x	x	x	x	x
	Personal Hygiene G0110J1	x	x	x	x	x
	Bathing grouped as Independent, supervised, physical help limited to transfer only, physical help in part of bathing activity, total dependence/activity did not occur (G0120)	x	x	x	x	x
	Balance (each coded separately)[3]					
	Moving from seated to standing G0300A			x	x	x
	Walking G0300B	x	x	x	x	x
	Turning around and facing the opposite direction G0300C	x	x	x	x	x
	Moving on and off toilet G0300D	x	x	x	x	
	Surface to Surface Transfer G0300E	x	x	x	x	x
	Steady at all times					
	Not steady, but able to stabilize without staff assistance					
	Not steady, only able to stabilize with staff assistance					
	Activity did not occur					
	Urinary incontinence rated as Always continent/occasionally incontinent, frequently/always incontinent, not rated (catheter, ostomy, no urine output) (H0300)	x	x	x	x	x
	Bowel incontinence rated as Always continent/occasionally incontinent, frequently/always incontinent, not rated (ostomy, no bowel movement) (H0400)	x	x	x	x	x
PROGNOSIS	Life Prognosis Less than 6 Months (J1400)					x
	Special Treatments/Programs: Hospice Post-admit (O0100K2)	x	x	x	x	x
CLINICAL CONDITIONS	Shortness of Breath With Exertion (J1100A)	x	x	x	x	x
	Shortness of Breath When Sitting (J1100B)	x	x	x	x	x
	Shortness of Breath When Lying Flat (J1100C)	x	x			
	Any Swallowing Disorder (K0100A-	x	x			

Variable Description (with MDS item #)		<=7 days	<=14 days	<=20 days	<=45 days	Median LOS
	D)					
	Weight loss (K0300)	x	x	x		
	Pressure ulcer (M0300B1-D1)	x	x	x	x	x
	Wound Infection (I2500 Active Diagnoses)	x	x	x	x	x
	Hemiplegia (I4900 Active Diagnoses or ICD-9)	x	x	x	x	x
	Paraplegia (I5000 Active Diagnoses or ICD-9)	x		x		
	Quadriplegia (I5100 Active Diagnoses or ICD-9)	x	x		x	x
CLINICAL TREATMENTS	Oxygen Post-admit (O0100C2)	x	x	x	x	
	Tracheostomy Post-admit (O0100E2)	x	x	x	x	x
	Ventilator Post-admit (O0100F2)	x				x
	Dialysis Post-admit (O0100J2)	x	x	x	x	x
	Max # injections (N0300 or N0350a)	x	x	x	x	
	Antipsychotic use (N0400a or N0410a)	x	x	x	x	x
CLINICAL DIAGNOSES	Anemia (I0200 Active Diagnoses)	x		x	x	
	Heart Failure (CHF) (I0600 Active Diagnoses)	x	x	x	x	x
	Hypertension (I0700 Active Diagnoses)	x	x	x	x	x
	Hypotension (I0800 Active Diagnoses)	x	x	x		
	Neurogenic Bladder (I1550 Active Diagnoses)	x	x			x
	Obstructive Uropathy (I1650 Active Diagnoses)	x	x			
	Mult-drug resistant organism (MDRO; I1700 Active Diagnoses)	x	x	x		
	Aphasia (I4300 Active Diagnoses or ICD-9)	x	x	x	x	x
	Cerebral Palsy (I4400 Active Diagnoses or ICD-9)	x	x			
	Pneumonia (I2000 Active Diagnoses)	x	x	x	x	x
	Septicemia (I2100 Active Diagnoses)	x	x		x	
	Urinary Tract Infection (UTI) (I2300 Active Diagnoses)	x	x	x	x	x
	Viral Hepatitis (I2400 Active Diagnoses)	x	x	x	x	x
	Diabetes Mellitus (I2900 Active Diagnoses)	x	x	x	x	x
	Hyponatremia (I3100 Active Diagnoses)			x		

Variable Description (with MDS item #)		<=7 days	<=14 days	<=20 days	<=45 days	Median LOS
	Hyperkalemia (I3200 Active Diagnoses)			x	x	
	Hyperlipidemia (I3300 Active Diagnoses)	x		x	x	x
	Hip Fracture (I3900 Active Diagnoses)	x	x	x	x	x
	Other Fracture (I4000 Active Diagnoses)	x	x	x	x	x
	Alzheimer's Disease or Dementia (I4200, I4800 Active Diagnoses or ICD-9)	x	x	x	x	x
	Stroke (CVA or TIA or Stroke) (I4500 Active Diagnoses or ICD-9)	x	x	x	x	x
	Huntington's (I5250 Active Diagnoses or ICD-9)		x	x	x	x
	Parkinson's (I5300 Active Diagnoses or ICD-9)	x	x	x	x	x
	Multiple Sclerosis (I5200 Active Diagnoses or ICD-9)	x	x	x	x	
	Seizure (I5400 Active Diagnoses)	x	x	x	x	x
	Traumatic Brain Injury (I5500 Active Diagnoses)	x	x	x	x	x
	Malnutrition (I5600 Active Diagnoses)	x	x	x	x	x
	Anxiety Disorder (I5700 Active Diagnoses)	x	x	x		x
	Depression (I5800 Active Diagnoses)	x	x	x	x	x
	Manic Depression (I5900 Active Diagnoses)	x	x	x	x	x
	Psychotic (I5950 Active Diagnoses)		x	x	x	x
	Schizophrenia (I6000 Active Diagnoses)	x	x	x	x	x
	Asthma, COPD, Chronic Lung Disease (I6200 Active Diagnoses)	x	x	x		
	Age and Alz/Dementia interaction	x	x	x	x	x

[1] Staff assessed means that the resident was not given a BIMS self-assessed score because they (a) chose not to participate in the BIMS, (b) 4 or more items were coded 0 because the resident chose not to answer or gave a nonsensical response, or (c) any of the BIMS items were coded with a dash. If C1000 was coded 0, cognitive impairment was considered 'light'. If C1000 was coded 2, it was considered mediate, and a code of 3 was considered severe. The remaining staff assessed residents were given a missing cognitive impairment score.

[2] Activities (each coded separately). Each activity was coded 0 (independence); 1 (supervised), 2 (limited assistance); 3 (extensive assistance) or 4 (total dependence/only did activity once or twice/doesn't do activity). Responses were then dummied and entered as categorical variables into the model, using 'independence' as the reference group.

[3] Balance (each coded separately): Each category was coded from 0 (steady at all times) to 3 (activity did not occur). Responses were then dummied and entered as categorical variables into the model, using 'steady at all times' as the reference group.