User Documentation for the RUG-III Version 5.20 SAS Code
Iowa Foundation for Medical Care
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This is user documentation for the SAS code provided in the RUG-III Version 5.20 Grouper package.

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Introduction

The RUG-III classification SAS code provided with the Version 5.20 Grouper package is named **RUG520.SAS** and performs exactly the same RUG-III classification as the Version 5.20 DLL (**RUG520.DLL**). Each execution of the classification SAS code calculates both a hierarchical RUG-III classification and an index maximized classification. This SAS code supports the 34-group, 44-group, and 53-group RUG-III models and allows normal rehabilitation classification (only therapies received are considered with ordered therapies being ignored) and special Medicare rehabilitation classification (both therapies received and ordered therapies are considered).

Standard Parameters

Table 1 describes the standard input and output parameters for the SAS classification code (**RUG520.SAS**). These are the same parameters as used by the DLL with one exception. That the MDS record string parameter has been omitted for the SAS code. Instead all 108 MDS RUG-III items (see Section 9 of **Grouper Doc.pdf**) plus REC_ID and AA8a are required for the SAS code. REC_ID is a code indicating the type of MDS record (header record with code "A0", trailer record with "Z0", data record with code "B0", modification record with code "M0", or inactivation record with code "X0"). REC_ID and AA8a are needed in the SAS code to screen out records that are not appropriate for RUG-III classification (see Section 7 of **Grouper Doc.pdf**).

Table 1. Standard Input and Output Parameters for the SAS Classification Code

Parameter Name	Parameter Type	Data Type	Description
108 MDS RUG-III items plus REC_ID plus AA8a	Input	String	All 108 MDS RUG-III items using standard names (e.g., B1, B2a, etc.) plus REC_ID (first 2 bytes in a standard MDS submission record) plus AA8a.
sRehabType	Input	String	A string containing one of the following two values designating the type of rehab classification to perform: • "Mcare" = special Medicare rehabilitation classification (using ordered therapies in Section T on 5-day and readmission/return assessments) • "Other" = rehabilitation classification does not use ordered therapies in Section T Upper, lower, or mixed case is acceptable when supplying this parameter.
sModel	Input	String	A string containing one of the following three values designating the RUG-III model to use: • "53" = 53-group model • "44" = 44-group model • "34" = 34-group model
iQuarterlyFlag	Input	Integer	The quarterly flag is an integer value indicating whether RUG-III is to be calculated for quarterly assessments. 0 = RUG-III not calculated for quarterlies 1 = RUG-III is calculated for quarterlies The grouper will automatically determine whether the MDS record corresponds to a quarterly assessment.

Table 1. Standard Input and Output Parameters for the SAS Classification Code

Parameter Name	Parameter Type	Data Type	Description
nCmiArray	Input	Double precision array	nCmiArray is a double-precision array containing case mix indices (CMIs). This array affects the index maximized RUG-III classification returned by the grouper. The array must be supplied even if you are not interested in the index maximized RUG-III classification. If you are not interested in index maximized results, you can initialize the array with zeroes and the index maximized RUG-III will equal the hierarchical RUG-III classification. For C++ and Visual Basic programs calling the grouper DLL, the array must be dimensioned from 0 to 58. Put the 58 CMI indices in elements 1 to 58 (element 0 can be initialized to 0.0). For SAS programs using the SAS grouper module, the array should be dimensioned with 58 elements and there is no "0" element. The RUG-III groups corresponding to the 58 elements in nCmiArray are listed in Section 4 of this document. The standard CMI sets available with Version 5.20 are available in Section 9 of "Grouper Doc.pdf".
sRugHier	Output	String	The grouper will return a 3-byte character code (e.g., "RUC") for the hierarchical RUG-III group. When you call the grouper, you should initialize this variable to a blank string. This code will be the default RUG-III group (BC1) if any of the 108 RUG-III MDS items are out of range.
sRugMax	Output	String	The grouper will return a 3-byte character code (e.g., "RUC") for the index maximized RUG-III group. When you call the grouper, you should initialize this variable to a blank string. This code will be the default RUG-III group (BC1) if any of the 108 RUG-III MDS items are out of range.
nRugHier	Output	Integer	The grouper will return the numeric code for the hierarchical RUG-III group. This is the numeric position of the group in the standard group order in Section 4. When you call the grouper, you should initialize this variable to a 0 value. Such numeric values have proved useful to researchers studying RUG-III. This numeric code will be that for the default RUG-III group (58) if any of the 108 RUG-IIIMDS items are out of range.
nRugMax	Output	Integer	The grouper will return the numeric code for the index maximized RUG-III group. This is the numeric position of the group in the standard group order in Section 4. When you call the grouper, you should initialize this variable to a 0 value. Such numeric values have proved useful to researchers studying RUG-III. This numeric code will be that for the default RUG-III group (58) if any of the 108 RUG-III MDS items are out of range.

Table 1. Standard Input and Output Parameters for the SAS Classification Code

Parameter Name	Parameter Type	Data Type	Description
nCmiValueHier	Output	Double precision	nCmiValueHier is a double-precision variable which on return will contain the case mix index value (from nCmiArray) corresponding to the resulting hierarchical RUG-III value. When you call the grouper, you should initialize this variable to a 0.0 value.
nCmiValueMax	Output	Double precision	nCmiValueMax is a double-precision variable which on return will contain the case mix index value (from nCmiArray) corresponding to the resulting index maximized RUG-III value. When you call the grouper, you should initialize this variable to a 0.0 value.
iAdlSum	Output	Integer	iAdlSum is an integer variable which on return will contain the RUG-III ADL scale score (range of 4 to 18). When you call the grouper, you should initialize this variable to a 0 value.
iCpsCode	Output	Integer	iCpsCode is an integer variable which on return will contain the Cognitive Performance Scale (CPS) score (range of 0 to 6). When you call the grouper, you should initialize this variable to a 0 value.
sRugsVersion	Output	String	sRugsVersion is a string variable which returns the version of the RUG-III classification logic which was used. This will be a value of "07" for the 44-group model, "08" for the 34-group model, and "09" for the 53-group model. When you call the grouper, you should initialize this variable to a blank string.
sDllVersion	Output	String	sDllVersion is a string which returns a value of "1.00", the version number (within RUG-III Grouper Version 5.20) for the present DLL or SAS grouper module. When you call the grouper, you should initialize this variable to a blank string.

Table 1. Standard Input and Output Parameters for the SAS Classification Code

Parameter Name	Parameter Type	Data Type	Description
iError	Output	Integer	The grouper will return an integer error code. The error code will have one of the following values: 0 = No grouper calling error, RUG-III was calculated or set to the default value if out-of-range values were found for any RUG-III item 1 = sRehabType parameter was invalid 2 = sModel parameter was invalid 3 = iQuarterlyFlag parameter was invalid 4 = RUG-III not calculated for this type of MDS record. This code will always be returned for an MDS batch header record, MDS batch trailer record, discharge record, reentry record, or inactivation record. It will also be returned for a quarterly assessment if the user has indicated that RUG-III is not to be calculated for quarterly assessments (iQuarterlyFlag = 0). Finally, this error code will also be returned if the reasons for assessment codes (MDS items AA8a and AA8b) are invalid (e.g., out of range). 5 = Invalid CMI value used. No CMI value may be less than or equal to –9999.

Table 2 describes the elements of the nCmiArray standard input parameter. The file "Cmi520.xls" presents the standard CMI sets available with Version 5.20 in a format that will allow ease of coding.   The grouper package also includes SAS modules for defining each of the 6 standard CMI sets available with Version 5.20 of the grouper. For example, the file ***C01_CMI.SAS*** is a SAS code module for the C01 standard CMI set. Note that in contrast to the DLL, the SAS code does not require a CMI array starting with a 0 element and the 0 element has been omitted from Table 2 below.

Table 2. Elements in nCmiArray[ ]

CMI Array Element	Corresponding RUG-III Group
Rehabilitation/Extensive Groups for 53-group model	
1	RUX: Rehabilitation Ultra High Plus Extensive / ADL 16-18
2	RUL: Rehabilitation Ultra High Plus Extensive / ADL 7 – 15

Table 2. Elements in nCmiArray[ ]

CMI Array Element	Corresponding RUG-III Group
3	RVX: Rehabilitation Very High Plus Extensive / ADL 16 – 18
4	RVL: Rehabilitation Very High Plus Extensive / ADL 7 - 15
5	RHX: Rehabilitation High Plus Extensive / ADL 13 - 18
6	RHL: Rehabilitation High Plus Extensive / ADL 7 – 12
7	RMX: Rehabilitation Medium Plus Extensive / ADL 15 – 18
8	RML: Rehabilitation Medium Plus Extensive / ADL 7 - 14
9	RLX: Rehabilitation Low Plus Extensive / ADL 7 - 18
44-Group Rehabilitation Groups for the 53-group and 44-group models	
10	RUC: Rehabilitation Ultra High / ADL 16 – 18
11	RUB: Rehabilitation Ultra High / ADL 9 – 15
12	RUA: Rehabilitation Ultra High / ADL 4 - 8
13	RVC: Rehabilitation Very High / ADL 16 – 18
14	RVB: Rehabilitation Very High / ADL 9 – 15
15	RVA: Rehabilitation Very High / ADL 4 - 8
16	RHC: Rehabilitation High / ADL 13 – 18
17	RHB: Rehabilitation High / ADL 8 – 12
18	RHA: Rehabilitation High / ADL 4 - 7
19	RMC: Rehabilitation Medium / ADL 15 – 18
20	RMB: Rehabilitation Medium / ADL 8 – 14
21	RMA: Rehabilitation Medium / ADL 4 - 7
22	RLB: Rehabilitation Low / ADL 14 – 18
23	RLA: Rehabilitation Low / ADL 4 – 13
Extensive Groups for all models (53-, 44-, and 34-groups)	
24	SE3: Extensive Services 3 / ADL > 6
25	SE2: Extensive Services 2 / ADL > 6
26	SE1: Extensive Services 1 / ADL > 6
Rehabilitation Groups for the 34-group model	

Table 2. Elements in nCmiArray[ ]

CMI Array Element	Corresponding RUG-III Group
27	RAD: Rehabilitation All Levels / ADL 17 - 18
28	RAC: Rehabilitation All Levels / ADL 14 – 16
29	RAB: Rehabilitation All Levels / ADL 9 - 13
30	RAA: Rehabilitation All Levels / ADL 4 - 8
Remaining Groups for all models (53-, 44-, and 34-groups)	
31	SSC: Special Care / ADL 17 – 18
32	SSB: Special Care / ADL 15 – 16
33	SSA: Special Care / ADL 4 – 14
34	CC2: Clinically Complex with Depression / ADL 17 - 18
35	CC1: Clinically Complex / ADL 17 – 18
36	CB2: Clinically Complex with Depression / ADL 12 - 16
37	CB1: Clinically Complex / ADL 12 – 16
38	CA2: Clinically Complex with Depression / ADL 4 - 11
39	CA1: Clinically Complex / ADL 4 – 11
40	IB2: Cog. Impairment with Nursing Rehab / ADL 6 - 10
41	IB1: Cognitive Impairment / ADL 6 – 10
42	IA2: Cog. Impairment with Nursing Rehab / ADL 4 - 5
43	IA1: Cognitive Impairment / ADL 4 - 5
44	BB2: Behavior Problem with Nursing Rehab / ADL 6 - 10
45	BB1: Behavior Problem / ADL 6 – 10
46	BA2: Behavior Problem with Nursing Rehab / ADL 4 - 5
47	BA1: Behavior Problem / ADL 4 - 5
48	PE2: Physical Function with Nursing Rehab / ADL 16 - 18
49	PE1: Physical Function / ADL 16 – 18
50	PD2: Physical Function with Nursing Rehab / ADL 11 - 15
51	PD1: Physical Function / ADL 11 – 15
52	PC2: Physical Function with Nursing Rehab / ADL 9 - 10

Table 2. Elements in nCmiArray[ ]

CMI Array Element	Corresponding RUG-III Group
53	PC1: Physical Function / ADL 9 – 10
54	PB2: Physical Function with Nursing Rehab / ADL 6 - 8
55	PB1: Physical Function / ADL 6 - 8
56	PA2: Physical Function with Nursing Rehab / ADL 4 - 5
57	PA1: Physical Function / ADL 4 - 5
58	BC1: RUG-III group not calculated due to data errors

Using the SAS Code

To use the RUG-III classification SAS code, follow these steps:

- Read MDS records into a SAS data set with the MDS items having names corresponding to their labels on the form and their names in the standard MDS data specifications (e.g., B1, B2a, etc.). The SAS data must include all MDS RUG-III items (a list of the MDS RUG-III items is available in Section 8 of *Grouper Doc.pdf*. In order to allow appropriate MDS record screening, this data set must also include the REC_ID (first 2 bytes of an MDS record in standard format) and the AA8a reason for assessment item. The grouper package includes the program *Read_MDS.SAS*. This SAS program takes MDS records in standard submission format and creates a SAS data set appropriate for RUG-III classification.

- Write a SAS program to set the required parameters for RUG-III classifications. The grouper package includes an example program called *Call520.SAS*. This program reads a SAS data set named Test520a and outputs a new data set named Test520a_34 with 34-group RUG-III results included, based on the D01 CMI set and normal rehabilitation classification (ordered therapies not considered). This code includes the *D01_CMI.SAS* and the *RUG520.SAS* classification code modules by reference.