

# Package ‘pccc’

March 10, 2018

**Title** Pediatric Complex Chronic Conditions

**Version** 1.0.1

**Description** An implementation of the pediatric complex chronic conditions (CCC) classification system using R and C++.

**Depends** R (>= 3.0.2)

**License** GPL-2

**Encoding** UTF-8

**LazyData** true

**Imports** dplyr (>= 0.7.0), Rcpp (>= 0.12.11)

**Suggests** covr, knitr, rmarkdown, testthat, readr

**RoxygenNote** 6.0.1

**LinkingTo** Rcpp (>= 0.12.11)

**VignetteBuilder** knitr

**URL** <https://github.com/CUD2V/pccc>

**BugReports** <https://github.com/CUD2V/pccc/issues>

**NeedsCompilation** yes

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pccc-package	<i>pccc: Pediatric Complex Chronic Conditions</i>
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## Description

An implementation of the pediatric complex chronic conditions (CCC) classification system. Implemented for the International Classification of Disease (ICD) 9th and 10th revisions.

## Reference Material

The original paper, Feudtner C, et al. (2014), was published with open access. For ease, a copy of the paper is included in this package. See the examples below for instructions on opening this pdf from within R or outside of R. You can view the publication online at <http://bmcpediatr.biomedcentral.com/articles/10.1186/1471-2431-14-199>.

Feudtner et. al. provided a SAS macro and STATA program to implement the CCC. These files are also provided for reference. See the Examples for instructions on opening these files.

Lastly, the appendix tables in the file Categories\_of\_CCCv2\_and\_Corresponding\_ICD.docx have also been included with this package.

## References

Feudtner C, et al. Pediatric complex chronic conditions classification system version 2: updated for ICD-10 and complex medical technology dependence and transplantation, BMC Pediatrics, 2014, 14:199, DOI: 10.1186/1471-2431-14-199

## Examples

```
## Not run:
# To open the Feudtner et.al. pdf from within R use the following
if (!is.null(getOption("pdfviewer"))) {
  system(paste0(getOption("pdfviewer"), " ",
                file.path(system.file("pccc_references", package = "pccc")), "/" ,
                "Feudtner_etal_2014.pdf"))
}

# If the pdf cannot be opened, you should be able to open it manually by
# navigating to
file.path(system.file("pccc_references", package = "pccc"))

# To view the original SAS program
file.show(system.file("pccc_references", "ccc_version2_sas.sas", package = "pccc"))
```

```
# To view the original STATA program
file.show(system.file("pccc_references", "ccc.do", package = "pccc"))

## End(Not run)
```

---

ccc *Complex Chronic Conditions (CCC)*

---

### Description

Generate CCC and CCC subcategory flags and the number of categories.

### Usage

```
ccc(data, id, dx_cols = NULL, pc_cols = NULL, icdv)
```

### Arguments

data	a <code>data.frame</code> containing a patient id and all the ICD-9-CM or ICD-10-CM codes. The <code>data.frame</code> passed to the function should be in wide format.
id	bare name of the column containing the patient id
dx_cols, pc_cols	column names with the diagnostic codes and procedure codes respectively. These argument are passed to <a href="#">select</a> .
icdv	ICD version 9 or 10

### Details

It is recommended that you view the codes defining the CCC via [get\\_codes](#) and make sure that the ICD codes in your data set are formatted in the same way. The ICD codes used for CCC are character strings must be formatted as follows:

- *\*Do not\** use decimal points or other separators
- ICD 9 codes: Codes less than 10 should be left padded with 2 zeros. Codes less than 100 should be left padded with 1 zero.

See `vignette("pccc-overview")` for more details.

### Value

A `data.frame` with a column for the subject id and integer (0 or 1) columns for each each of the categories.

### References

See [pccc-package](#) for published paper on the topic of identifying Complex Chronic Conditions

**See Also**

[get\\_codes](#) to view the ICD codes used to define the CCC. [select](#) for more examples and details on how to identify and select the diagnostic and procedure code columns.

**Examples**

```
eg_data <-
  dplyr::data_frame(id = letters,
                    dx1 = c(NA, NA, sample(get_codes(10)[["hemato_immu", "dx"]], 24)),
                    dx2 = c("A", sample(get_codes(10)[["gi", "dx"]], 25)),
                    dx3 = LETTERS,
                    pc1 = c("B", sample(get_codes(10)[["cvd", "pc"]], 25)),
                    pc2 = LETTERS,
                    other_col = LETTERS)

ccc(eg_data,
     id,
     dx_cols = dplyr::starts_with("dx"),
     pc_cols = dplyr::starts_with("pc"),
     icdv = 10)
```

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 comparability

*Multiple Cause of Death (MCOD) file extract*


---

**Description**

The Center for Disease Control has made publicly available death certificate data. This data set is a subset of the 2006 MCODE file for decedents aged  $\leq 21$  showing just the underlying cause of death diagnosis code in ICD-9-CM and ICD-10.

**Usage**

```
comparability
```

**Format**

A data frame with 65037 rows and 3 variables.

**id** Sequentially assigned patient identifier

**icd9** Underlying Cause of Death ICD 9 CM diagnosis code

**icd10** Underlying Cause of Death ICD 10 diagnosis code

**Details**

See ‘vignette("pccc-example")’ for more details about the MCODE source file.

---

 get\_codes

*Get (view) Diagnostic and Procedure Codes*


---

**Description**

View the ICD, version 9 or 10, for the Complex Chronic Conditions (CCC) categories.

**Usage**

```
get_codes(icdv)
```

**Arguments**

icdv                    and integer value specifying ICD version. Accepted values are 9 or 10.

**Details**

The CCC categories for diagnostic and procedure codes are:

category	dx	dx_fixed	pc	pc_fixed
neuromuscul	X	X	X	
cvd	X	X	X	
respiratory	X	X	X	
renal	X		X	
gi	X		X	
hemato_immu	X		X	
metabolic	X		X	X
congeni_genetic	X			
malignancy	X		X	
neonatal	X			
tech_dep	X		X	
transplant	X		X	

The ICD codes were taken from the SAS macro provided by the reference paper.

**Value**

A matrix of character vectors. Rows are the categories and columns for diagnostic and procedure codes.

**References**

Feudtner C, et al. Pediatric complex chronic conditions classification system version 2: updated for ICD-10 and complex medical technology dependence and transplantation, BMC Pediatrics, 2014, 14:199, DOI: 10.1186/1471-2431-14-199

### Examples

```
# All ICD 9 codes for CCC
get_codes(9)

# All ICD 10 codes for CCC
get_codes(10)

# Get all the codes for ICD 9 related to malignancy
get_codes(9)["malignancy", ]
```

---

pccc\_icd10\_dataset      *Randomly Generated ICD 10 Sample Data Set*

---

### Description

This dataset was produced from a tool available at [https://github.com/magic-lantern/icd\\_file\\_generator](https://github.com/magic-lantern/icd_file_generator). ICD codes were taken from CMS. The code source, for both the diagnosis and produced codes can be found at <https://www.cms.gov/Medicare/Coding/ICD10/2017-ICD-10-CM-and-GEMs.html>

### Usage

```
pccc_icd10_dataset
```

### Format

A data frame with 1000 rows and 31 variables. There is a patient identifier, ten diagnosis codes, ten procedure codes, and ten "other data" values, specifically:

**id** Sequentially assigned patient identifier

**dx1** a ICD 10 diagnosis code

**dx2** a ICD 10 diagnosis code

**dx3** a ICD 10 diagnosis code

**dx4** a ICD 10 diagnosis code

**dx5** a ICD 10 diagnosis code

**dx6** a ICD 10 diagnosis code

**dx7** a ICD 10 diagnosis code

**dx8** a ICD 10 diagnosis code

**dx9** a ICD 10 diagnosis code

**dx10** a ICD 10 diagnosis code

**pc1** a ICD 10 procedure codes

**pc2** a ICD 10 procedure codes

**pc3** a ICD 10 procedure codes

- pc4** a ICD 10 procedure codes
- pc5** a ICD 10 procedure codes
- pc6** a ICD 10 procedure codes
- pc7** a ICD 10 procedure codes
- pc8** a ICD 10 procedure codes
- pc9** a ICD 10 procedure codes
- pc10** a ICD 10 procedure codes
- g1** Random data to simulate other data often present in export of patient data with 20% of values missing.
- g2** Random data to simulate other data often present in export of patient data with 20% of values missing.
- g3** Random data to simulate other data often present in export of patient data with 20% of values missing.
- g4** Random data to simulate other data often present in export of patient data with 20% of values missing.
- g5** Random data to simulate other data often present in export of patient data with 20% of values missing.
- g6** Random data to simulate other data often present in export of patient data with 20% of values missing.
- g7** Random data to simulate other data often present in export of patient data with 20% of values missing.
- g8** Random data to simulate other data often present in export of patient data with 20% of values missing.
- g9** Random data to simulate other data often present in export of patient data with 20% of values missing.
- g10** Random data to simulate other data often present in export of patient data with 20% of values missing.

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pccc\_icd9\_dataset

*Randomly Generated ICD 9 Sample Data Set*

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### **Description**

This dataset was produced from a tool available at [https://github.com/magic-lantern/icd\\_file\\_generator](https://github.com/magic-lantern/icd_file_generator). ICD codes were taken from CMS. The ICD 9 diagnosis and procedure codes were generated with 20 missing values. Code source: <https://www.cms.gov/Medicare/Coding/ICD9ProviderDiagnosticCodes/codes.html>

### **Usage**

pccc\_icd9\_dataset

**Format**

A data frame with 1000 rows and 31 variables. There is a patient identifier, ten diagnosis codes, ten procedure codes, and ten "other data" values, specifically:

**id** Sequentially assigned patient identifier

**dx1** a ICD 9 diagnosis code

**dx2** a ICD 9 diagnosis code

**dx3** a ICD 9 diagnosis code

**dx4** a ICD 9 diagnosis code

**dx5** a ICD 9 diagnosis code

**dx6** a ICD 9 diagnosis code

**dx7** a ICD 9 diagnosis code

**dx8** a ICD 9 diagnosis code

**dx9** a ICD 9 diagnosis code

**dx10** a ICD 9 diagnosis code

**pc1** a ICD 9 procedure codes

**pc2** a ICD 9 procedure codes

**pc3** a ICD 9 procedure codes

**pc4** a ICD 9 procedure codes

**pc5** a ICD 9 procedure codes

**pc6** a ICD 9 procedure codes

**pc7** a ICD 9 procedure codes

**pc8** a ICD 9 procedure codes

**pc9** a ICD 9 procedure codes

**pc10** a ICD 9 procedure codes

**g1** Random data to simulate other data often present in export of patient data with 20% of values missing.

**g2** Random data to simulate other data often present in export of patient data with 20% of values missing.

**g3** Random data to simulate other data often present in export of patient data with 20% of values missing.

**g4** Random data to simulate other data often present in export of patient data with 20% of values missing.

**g5** Random data to simulate other data often present in export of patient data with 20% of values missing.

**g6** Random data to simulate other data often present in export of patient data with 20% of values missing.

**g7** Random data to simulate other data often present in export of patient data with 20% of values missing.



- g8** Random data to simulate other data often present in export of patient data with 20% of values missing.
- g9** Random data to simulate other data often present in export of patient data with 20% of values missing.
- g10** Random data to simulate other data often present in export of patient data with 20% of values missing.

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test\_helper

*Tool to help access internal variables to use in testthat scripts*

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### **Description**

Tool to help access internal variables to use in testthat scripts

### **Usage**

```
test_helper(var)
```

### **Arguments**

var                   bare name of the internal variable to be accessed.

### **Value**

Object from internal PCCC name space (if it exists)

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