

Graphics Device Tabular Output

useR! 2010
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Introduction

- ❑ In corporate and educational settings, what is the optimal approach to performing statistical analysis and presenting tabular data?
 - SAS + ODS / Text editor / Excel
 - R + LaTeX / Text editor
 - ...

Our Company as an Example

- ❑ Visiting Nurse Service of New York (VNSNY) is nation's largest not-for-profit home care agency with an average daily census of 28,444 patients and serving a total of 107,923 in 2009
- ❑ Employs 14,080 people, mostly consisting of registered nurses, rehabilitation therapists, social workers, and home health aides

The Center for Home Care Policy & Research

- The Center fulfills the main research and reporting functions for the company
 - Reports on a great variety of medical, financial, and outcomes data
 - Performs analysis and statistical modeling which often borders data mining (complex and dynamic output)

Motivation/Existing Alternatives

- ❑ Existing method at VNSNY was exporting tables from SAS to Excel (via Dynamic Data Exchange) for subsequent report formatting
 - Unstructured and messy SAS code
 - Labels were not table driven
 - Very susceptible to human error
- ❑ Experimented with SAS ODS
 - Formatting language
 - A lot of syntax for moderate quality
- ❑ LaTeX
 - Might be overkill when only a couple of tables are needed
 - Learning curve

Desired Features

- ❑ Agency staff demands features that are performed in excel, including:
 - Formatting of text (font, font face, color)
 - Additional formatting for column and row hierarchies
 - Row highlighting
 - Footer/Footnotes
 - Justification of columns in table

- ❑ Statistical programmers demand a hands off approach, need to be smart enough to:
 - Control page layout (margins, starting position)
 - Manage page overflow
 - Have many applications

Why R?

- ❑ Remain in the same environment where the statistical summaries are preformed
- ❑ High quality of graphics device provides the useR with the painters approach to presenting data
- ❑ If tabular output is displayed in R-graphics device, it provides the useR with a variety of file formats
- ❑ Object oriented programming and the data structures within R, along with the `grid` package make a lot of the features described earlier moderately easy to implement

Idea

- ❑ Statistical summary data has an inherent structure
- ❑ Exploit structures by having them drive the layout and formatting of a table
- ❑ Additional formatting and more complicated presentation can be defined through parameter declaration and escape characters
- ❑ Resulting tables should result in final printable output

General Overview of `printdevice.report`

- ❑ When given a data frame, the function identifies characteristics that drive the presentation (number of rows and columns, column names, etc.)
- ❑ Under default or specified `gpar` settings, calculates the width and height of a character using `grobWidth` and `grobHeight`
- ❑ For each column, identifies the maximum number of characters and calculates the maximum width (inches) to ensure that columns do not overlap
- ❑ Loops through the data frame and prints the data and column names utilizing `grid.text`

Basic Function Call

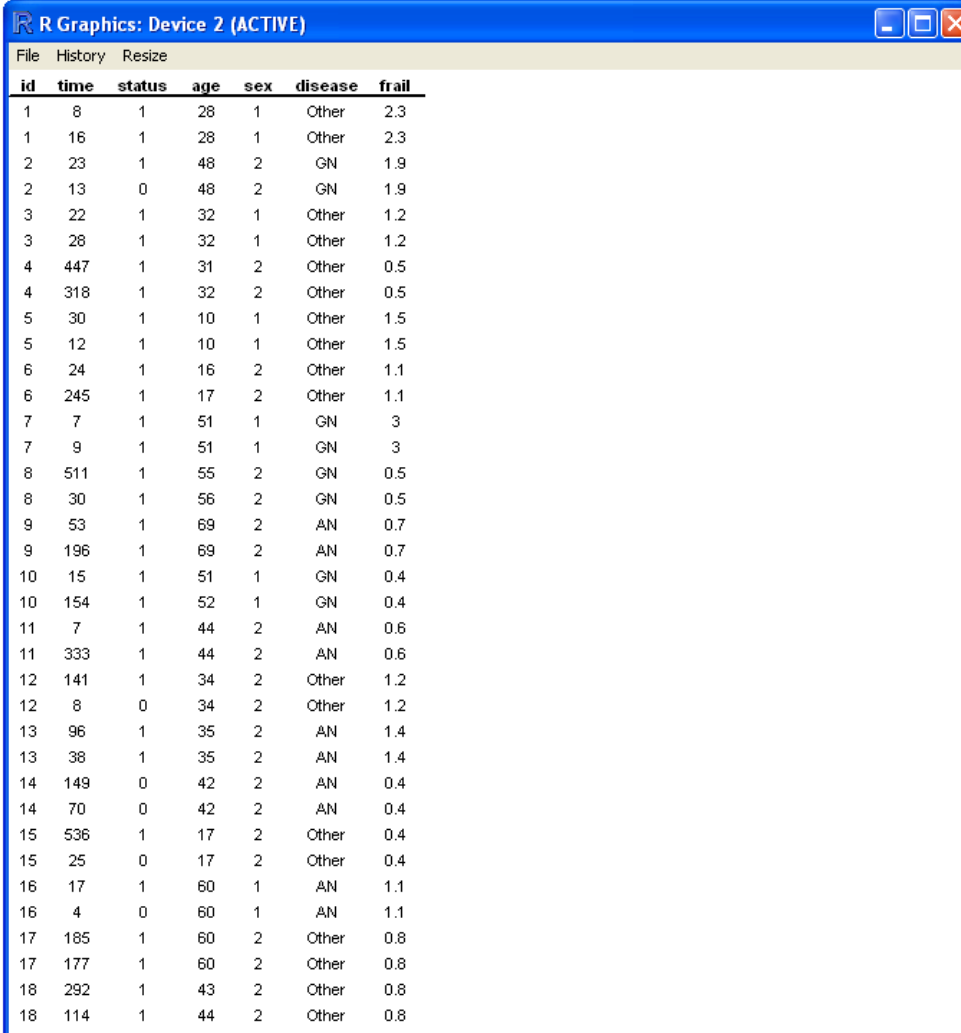
- Primary Goal is to print a data frame to device

```
require(survival)  
kidney
```

	id	time	status	age	sex	disease	frail
1	1	8	1	28	1	Other	2.3
2	1	16	1	28	1	Other	2.3
3	2	23	1	48	2	GN	1.9
4	2	13	0	48	2	GN	1.9
5	3	22	1	32	1	Other	1.2
				.			
				.			
74	37	78	1	52	2	PKD	2.1
75	38	63	1	60	1	PKD	1.2
76	38	8	0	60	1	PKD	1.2

```
printdevice.report(kidney)
```

Basic Function Call (cont'd)



R Graphics: Device 2 (ACTIVE)

File History Resize

id	time	status	age	sex	disease	frail
1	8	1	28	1	Other	2.3
1	16	1	28	1	Other	2.3
2	23	1	48	2	GN	1.9
2	13	0	48	2	GN	1.9
3	22	1	32	1	Other	1.2
3	28	1	32	1	Other	1.2
4	447	1	31	2	Other	0.5
4	318	1	32	2	Other	0.5
5	30	1	10	1	Other	1.5
5	12	1	10	1	Other	1.5
6	24	1	16	2	Other	1.1
6	245	1	17	2	Other	1.1
7	7	1	51	1	GN	3
7	9	1	51	1	GN	3
8	511	1	55	2	GN	0.5
8	30	1	56	2	GN	0.5
9	53	1	69	2	AN	0.7
9	196	1	69	2	AN	0.7
10	15	1	51	1	GN	0.4
10	154	1	52	1	GN	0.4
11	7	1	44	2	AN	0.6
11	333	1	44	2	AN	0.6
12	141	1	34	2	Other	1.2
12	8	0	34	2	Other	1.2
13	96	1	35	2	AN	1.4
13	38	1	35	2	AN	1.4
14	149	0	42	2	AN	0.4
14	70	0	42	2	AN	0.4
15	536	1	17	2	Other	0.4
15	25	0	17	2	Other	0.4
16	17	1	60	1	AN	1.1
16	4	0	60	1	AN	1.1
17	185	1	60	2	Other	0.8
17	177	1	60	2	Other	0.8
18	292	1	43	2	Other	0.8
18	114	1	44	2	Other	0.8

Table Row & Column Hierarchies

- ❑ The presentation of high dimensional summary data requires one to define how to simplify the dimensions in rows and columns while staying within a page layout
- ❑ This function allows two dimensions of formatting for rows and columns
 - Row dimensions are defined by declaring which column names label both dimensions (the “group” and “label” parameter)
 - Label alone just moves that column all the way to the left
 - Group is the higher dimensional description that encompasses the label
 - Columns of the table can be grouped together by repeating the group name followed by the escape character (“!!!”) in the column names

Example: Row Dimensions

□ Copied from R Graphics Device as a metafile

	Censored	Death
Demographics		
Age	60.25 (9.74)	63.28 (8.69)
Female	58.73% (37)	32.12% (53)
Performance Score		
ECOG (0=good 5=dead)	0.68 (0.64)	1.05 (0.72)
Karnofsky Physician (bad=0-good=100)	85.56 (10.89)	80.55 (12.59)
Karnofsky Patient (bad=0-good=100)	83.97 (14.54)	78.4 (14.4)
Weight Factors		
Calories Consumption	912.77 (453.41)	934.4 (384.29)
6 Month Weight Loss	9.11 (12.95)	10.12 (13.25)

Example: Row Dimensions (cont'd)

```
require(survival)
require(reshape)
```

```
head(lung)
```

	inst	time	status	age	sex	ph.ecog	ph.karno	pat.karno	meal.cal	wt.loss
1	3	306	2	74	1	1	90	100	1175	NA
2	3	455	2	68	1	0	90	90	1225	15
3	3	1010	1	56	1	0	90	90	NA	15
4	5	210	2	57	1	1	90	60	1150	11
5	1	883	2	60	1	0	100	90	NA	0
6	12	1022	1	74	1	1	50	80	513	0

```
lung$female <- lung$sex - 1
meas.vars <- c("age", "female", "ph.ecog", "ph.karno", "pat.karno", "meal.cal",
              "wt.loss")
lung.m <- melt(lung, id = "status", measure.vars = meas.vars, na.rm = TRUE )
smry.stats <- function(x)
  {avg <- mean(x); std <- sd(x); n <- sum(x);
  if (min(x) == 0 & max(x) == 1) # Binary Coded variables
  { smry <- paste(round(100*avg, 2), "% (", n, ")", sep = "") }
  else # Continuous
  { smry <- paste(round(avg, 2), " (", round(std, 2), ")", sep = "") }
  return(smry)}

(lung.smry <- cast(lung.m, variable ~status, function(x) smry.stats(x)))
```

Example: Row Dimensions (cont'd)

```
# Rename Columns for presentation
colnames(lung.smry)[2:3] <- c("Censored", "Death")
# Apply row dimension labels
lung.smry$variable <- c("Age", "Female", "ECOG (0=good 5=dead)", "Karnofsky Physician
                        (bad=0-good=100)", "Karnofsky Patient (bad=0-good=100)",
                        "Calories Consumption", "6 Month Weight Loss")
lung.smry$group <- c(rep("Demographics",2), rep("Performance Score", 3), rep("Weight
                        Factors",2))
```

```
lung.smry
```

	variable	Censored	Death	group
1	Age	60.25 (9.74)	63.28 (8.69)	Demographics
2	Female	58.73% (37)	32.12% (53)	Demographics
3	ECOG (0=good 5=dead)	0.68 (0.64)	1.05 (0.72)	Performance Score
4	Karnofsky Physician (bad=0-good=100)	85.56 (10.89)	80.55 (12.59)	Performance Score
5	Karnofsky Patient (bad=0-good=100)	83.97 (14.54)	78.4 (14.4)	Performance Score
6	Calories Consumption	912.77 (453.41)	934.4 (384.29)	Weight Factors
7	6 Month Weight Loss	9.11 (12.95)	10.12 (13.25)	Weight Factors

```
printdevice.report(lung.smry, label="variable", group="group")
```

Example: Column Dimensions

variable	Censored							Death						
	Std	Avg	Pcntl02.5	Median	Pcntl97.5	freq	n	Std	Avg	Pcntl02.5	Median	Pcntl97.5	freq	n
age	9.74	60.25	55	62	75.9	0	63	8.69	63.28	57	64	76	0	165
female	0.5	0.59	0	1	1	37	63	0.47	0.32	0	0	1	53	165
meal.cal	453.41	912.77	588	975	2222.5	0	47	384.29	934.4	684.5	1025	1500	0	134
pat.karno	14.54	83.97	80	90	100	0	63	14.4	78.4	70	80	100	0	162
ph.ecog	0.64	0.68	0	1	2	0	63	0.72	1.05	1	1	2	0	164
ph.karno	10.89	85.56	80	90	100	0	63	12.59	80.55	70	80	100	0	164
w.t.loss	12.95	9.11	0	4	38.475	0	62	13.25	10.12	0	8	37	0	152

Example: Column Dimensions (cont'd)

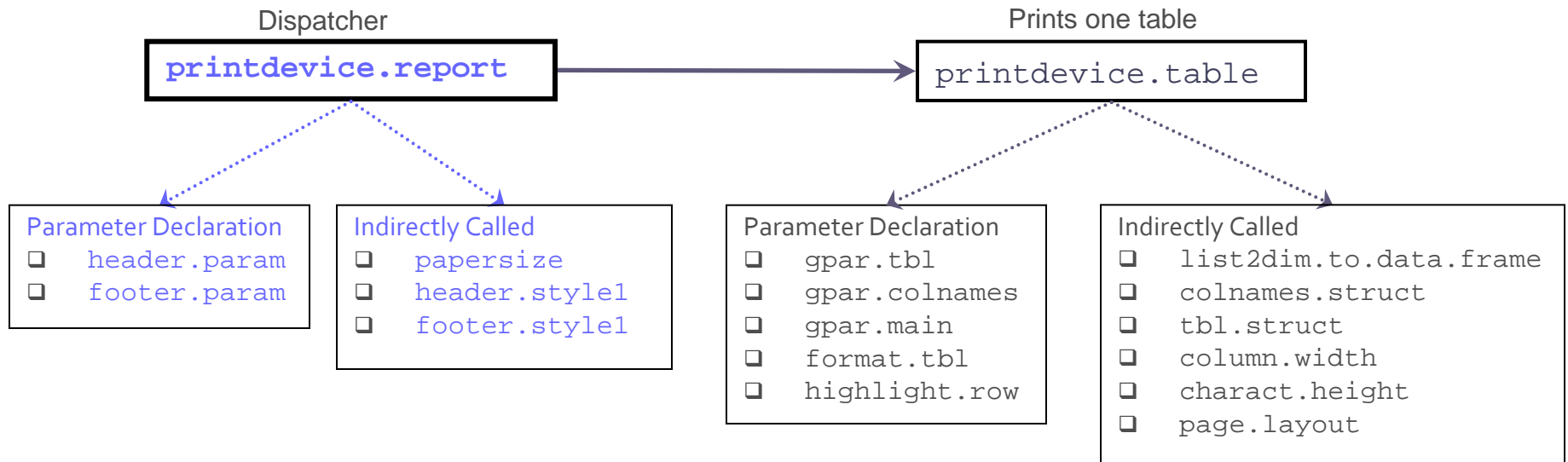
```
many.stats <- function(x)
  {avg <- round(mean(x), 2); std <- round(sd(x), 2);
  qtn <- quantile(x,c(0.25,0.5, .975)); pctl.025 <- qtn[1]; mdn <- qtn[2];
  pctl.975 <- qtn[3]; n.bin <- 0; n <- length(x);
  if (min(x) == 0 & max(x) == 1) {n.bin <- sum(x)}
  return(list(Std=std, Avg = avg, Pctl02.5 = pctl.025, Median=mdn,
             Pctl97.5 = pctl.975, freq = n.bin, n = n))
  }
(lung.many <- cast(lung.m, variable ~ . | status, function(x) many.stats(x)))
# Add dimension to columns
colnames(lung.many[[1]])[-1]<-paste("Censored!!!", colnames(lung.many[[1]])[-1], sep="")
colnames(lung.many[[2]])[-1]<-paste("Death!!!", colnames(lung.many[[2]])[-1], sep="")
[1]"Death!!!Std"          "Death!!!Avg"          "Death!!!Pctl02.5" "Death!!!Median"
[5]"Death!!!Pctl97.5" "Death!!!freq"          "Death!!!n"

lung.many.desc <- merge(lung.many[[1]], lung.many[[2]], "variable")
lung.many.desc
x11(height=7, width =8)

printdevice.report(lung.many.desc)
```

Program Organization

- ❑ There are parameters for `printdevice.*` that are also functions defining a list structure
- ❑ There are also helper functions that are indirectly called



Formatting Table: `format.tbl`

- ❑ Controls features of the table
- ❑ `format.tbl()` parameters
 - `line.space`
 - `justify`
 - `indent`
 - `buf.tbl`
 - `buf.grp.lbl`
 - `lty.group`
 - `bty` – style for border "=" - above and below, "o"- rectangle around table
 - `blwd` – line size for `bty`

Formatting Table: `gpar`

- ❑ There are three parameters that take a list structure to pass font formats to different calls to `grid.text`
- ❑ These parameters allow the user to separately control the formatting of the fonts displayed in the table, column names, and the table title text
- ❑ `gpar.tbl()`, `gpar.colnames()`, `gpar.main()`
 - `fontfamily`
 - `fontface`
 - `fontsize`
 - `col` – color of text
 - `bg`* – controls the background color

Other Features

- ❑ Additional lines can be forced into the column names, and the grouped column names by inserting the escape character “\n”
- ❑ Parameters
 - **main** – title for the table
 - **highlight.row** – list(highlight.row, col)
 - highlight.row – a logical vector or vector of integers indicating row numbers to be highlighted
 - col - highlight color
 - **footnote** – a vector of strings to be placed below the table, each position indicates a new line
 - **style** – style of the page layout (i.e. “rdevice”, “portrait”, etc.), which sets the appropriate or default values for page width, height and margins

Other Features (cont'd)

- `height, width` – custom height and width of page
- `margins` – margins in one of the following formats `c(all)`, `c(bottom/top, left/right)`, `c(bottom, left, top, right)`
- `fit.width` – logical, if TRUE will choose a `cex` to ensure that the width of the table exactly fits within the margins of the page
- `newpage` – logical, when the page runs out of space automatically starts a new one
- `header.param` – header for the page
- `footer.param` – footer for the page
- `lasttable` – object containing where on a page a previous call left off
- `tbl.space` – dependent on `lasttable`, the vertical space in between tables

Baseline Characteristics: Before Propensity Score Matching

	Physical Therapy (21155)	No Physical Therapy (5639)	Standardized Difference
Demographics			
Age	73.2 (15.0)	71.6 (15.5)	-0.1054
Male (%)	35.9 % (7598)	38.5 % (2170)	0.0531
Language Spoken			
English (%)	72.0 % (15238)	63.0 % (3551)	-0.1943
Spanish (%)	12.2 % (2591)	16.9 % (955)	0.1331
Referral Source			
Hospital (%)	71.2 % (15065)	81.0 % (4568)	0.2312
Physician (%)	0.88 % (187)	0.96 % (54)	0.0077
Nursing Home (%)	21.8 % (4616)	5.13 % (289)	-0.5043
Other (%)	6.08 % (1287)	12.9 % (728)	0.2344
General Health Status			
Regimen Change Prior to Admission (%)	63.6 % (13458)	66.7 % (3763)	0.0654
Primary Caregiver			
Primary Care Giver Identified	80.8 % (17100)	80.3 % (4526)	-0.0144
No Primary Care Giver Identified	19.2 % (4055)	19.7 % (1113)	0.0144
Sensory Status			
Severity of Pain (0-3)	1.14 (1.00)	1.03 (1.00)	-0.1167
Respiratory			
Dyspnea (0-4)	0.73 (0.93)	0.84 (1.00)	0.1144
Elimination Status			
Urinary Incontinence(%)	25.7 % (5442)	24.4 % (1378)	-0.0297
Integumentary Status			
Surgical Wound (%)	38.2 % (8078)	32.4 % (1827)	-0.1213
Mental Status			
Severity (0-4)	0.41 (0.72)	0.45 (0.78)	0.0467
Confuse (0-4)	0.54 (0.88)	0.58 (0.92)	0.0434
Functional Status			
Severity of ADLs Needing Assistance (0-33)	10.9 (5.43)	10.5 (6.26)	-0.0609
# of Needing Any Degree of ADL Assistance (0-8)	6.32 (1.82)	6.05 (2.08)	-0.135
Severity of IADLs Needing Assistance (0-18)	10.7 (2.82)	10.6 (3.14)	-0.0335
# of Needing Any Degree of IADL Assistance (0-6)	5.09 (0.64)	5.07 (0.71)	-0.0244
Medications			
# of Medications	8.26 (4.09)	8.09 (4.20)	-0.0401
Diagnosis			
Number of Illness (0-6)	4.74 (1.16)	4.54 (1.24)	-0.1648
Max Severity of Primary Diagnosis	2.36 (0.55)	2.40 (0.59)	0.0799

* Means are presented with Standard Deviations or Counts in parenthesis

** Rows are highlighted when the magnitude of the Standardized Difference is greater than 0.1

Baseline Characteristics: Before Propensity Score Matching

	Physical Therapy (21155)	No Physical Therapy (5639)	Standardized Difference
Therapy Diagnosis Groupings			
Cerebrovascular Disease (438 –438)	10.8 % (2289)	8.23 % (464)	-0.0884
Hereditary & Degenerative Disease of the CNS (337 –337)	5.68 % (1202)	4.56 % (257)	-0.051
Diseases of the Digestive System (579 –579)	6.41 % (1357)	7.64 % (431)	0.0481
Diseases of the Genitourinary System (629 –629)	7.71 % (1632)	10.9 % (616)	0.1106
Hemiplegia and Hemiparesis (342 –342)	0.24 % (50)	0.14 % (8)	-0.0217
Symptoms, Signs, and Ill-defined Conditions (799 –799)	54.5 % (11532)	36.7 % (2070)	-0.3633
Infectious and Parasitic Diseases (139 –139)	2.32 % (491)	3.14 % (177)	0.0502
Inflammatory Diseases of the CNS (326 –326)	0.15 % (31)	0.09 % (5)	-0.0169
Injury & Poisoning (999 –999)	5.85 % (1238)	7.61 % (429)	0.0701
Ischemic Heart Disease (414 –414)	18.0 % (3815)	20.9 % (1180)	0.0731
Mental Disorders (319 –319)	11.2 % (2365)	11.6 % (653)	0.0126
Muscular Dystrophies (359 –359)	0.22 % (46)	0.07 % (4)	-0.0386
Musculoskeletal System and Connective Tissue (739 –739)	41.7 % (8823)	35.3 % (1992)	-0.1314
Neoplasms (239 –239)	9.35 % (1978)	14.8 % (834)	0.1676
Disorder of the Nervous System (389 –389)	2.94 % (623)	3.01 % (170)	0.0041
Other Forms of Heart Disease (429 –429)	20.7 % (4384)	23.8 % (1342)	0.074
Parkinsons Disease (332 –332)	2.96 % (627)	1.74 % (98)	-0.081
Disorder of the Peripheral Nervous System (358 –358)	1.71 % (361)	2.02 % (114)	0.0233
Diseases of the Respiratory System (519 –519)	13.7 % (2900)	16.2 % (912)	0.0692
Multiple Sclerosis (340 –340)	0.82 % (174)	1.03 % (58)	0.0215
Diseases of the Skin and Subcutaneous Tissue (709 –709)	5.37 % (1137)	8.64 % (487)	0.128

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Baseline Characteristics: After Propensity Score Matching

	Physical Therapy (5501)	No Physical Therapy (5501)	Standardized Difference
Demographics			
Age	71.8 (15.6)	71.6 (15.5)	-0.0087
Male (%)	37.8 % (2082)	38.5 % (2118)	0.0135
Language Spoken			
English (%)	63.1 % (3472)	63.6 % (3497)	0.0094
Spanish (%)	17.2 % (945)	16.7 % (916)	-0.0141
Referral Source			
Hospital (%)	82.0 % (4510)	81.9 % (4508)	-9e-04
Physician (%)	1.00 % (55)	0.95 % (52)	-0.0056
Nursing Home (%)	5.64 % (310)	5.20 % (286)	-0.0193
Other (%)	11.4 % (626)	11.9 % (655)	0.0164
General Health Status			
Regimen Change Prior to Admission (%)	66.8 % (3672)	66.7 % (3670)	-8e-04
Primary Caregiver			
Primary Care Giver Identified	79.3 % (4361)	80.1 % (4408)	0.0212
No Primary Care Giver Identified	20.7 % (1140)	19.9 % (1093)	-0.0212
Sensory Status			
Severity of Pain (0-3)	1.04 (1.00)	1.04 (1.00)	-0.0078
Respiratory			
Dyspnea (0-4)	0.84 (0.99)	0.84 (1.00)	-0.0037

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Example: Formatting & Page Layout

The Effect of Physical Therapy on Adult Acute Care Patients NOT CONFIDENTIAL

Baseline Characteristics: Before Propensity Score Matching

	Physical Therapy (21158)	No Physical Therapy (8639)	Standardized Difference
Demographics			
Age	73.2 (15.0)	71.6 (15.5)	-0.1054
Male (%)	35.9 % (7598)	38.5 % (2170)	0.0531
Language Spoken			
English (%)	72.0 % (15238)	63.0 % (3551)	-0.1943
Spanish (%)	12.2 % (2591)	16.9 % (955)	0.1331
Referral Source			
Hospital (%)	71.2 % (15065)	81.0 % (4568)	0.2312
Physician (%)	0.88 % (187)	0.96 % (54)	0.0077
Nursing Home (%)	21.8 % (4616)	5.13 % (289)	-0.5043
Other (%)	6.08 % (1287)	12.9 % (728)	0.2344
General Health Status			
Regimen Change Prior to Admission (%)	63.6 % (13458)	66.7 % (3763)	0.0654
Primary Caregiver			
Primary Care Giver Identified	80.8 % (17100)	80.3 % (4526)	-0.0144
No Primary Care Giver Identified	19.2 % (4055)	19.7 % (1113)	0.0144
Sensory Status			
Severity of Pain (0-3)	1.14 (1.00)	1.03 (1.00)	-0.1167
Respiratory			
Dyspnea (0-4)	0.73 (0.93)	0.84 (1.00)	0.1144
Elimination Status			
Urinary Incontinence(%)	25.7 % (5442)	24.4 % (1378)	-0.0297
Integumentary Status			
Surgical Wound (%)	38.2 % (8078)	32.4 % (1827)	-0.1213
Mental Status			
Severity (0-4)	0.41 (0.72)	0.45 (0.78)	0.0467
Confuse (0-4)	0.54 (0.88)	0.58 (0.92)	0.0434
Functional Status			
Severity of ADLs Needing Assistance (0-33)	10.9 (5.43)	10.5 (6.26)	-0.0609
‡ of Needing Any Degree of ADL Assistance (0-8)	6.32 (1.82)	6.05 (2.08)	-0.135
Severity of IADLs Needing Assistance (0-18)	10.7 (2.82)	10.6 (3.14)	-0.0335
‡ of Needing Any Degree of IADL Assistance (0-6)	5.09 (0.64)	5.07 (0.71)	-0.0244
Medications			
‡ of Medications	8.26 (4.09)	8.09 (4.20)	-0.0401
Diagnosis			
Number of Illness (0-6)	4.74 (1.16)	4.54 (1.24)	-0.1648
Max Severity of Primary Diagnosis	2.36 (0.55)	2.40 (0.59)	0.0799

* Means are presented with Standard Deviations or Counts in parenthesis

** Rows are highlighted when the magnitude of the Standardized Difference is greater than 0.1

The Effect of Physical Therapy on Adult Acute Care Patients NOT CONFIDENTIAL

Baseline Characteristics: Before Propensity Score Matching

	Physical Therapy (21158)	No Physical Therapy (8639)	Standardized Difference
Therapy Diagnosis Groupings			
Cerebrovascular Disease (438 -438)	10.8 % (2289)	8.23 % (464)	-0.0884
Hereditary & Degenerative Disease of the CNS (337 -337)	5.68 % (1202)	4.56 % (257)	-0.051
Diseases of the Digestive System (579 -579)	6.41 % (1357)	7.64 % (431)	0.0481
Diseases of the Genitourinary System (629 -629)	7.71 % (1632)	10.9 % (616)	0.1106
Hemiplegia and Hemiparesis (342 -342)	0.24 % (50)	0.14 % (8)	-0.0217
Symptoms, Signs, and Ill-defined Conditions (799 -799)	54.5 % (11532)	36.7 % (2070)	-0.3633
Infectious and Parasitic Diseases (139 -139)	2.32 % (491)	3.14 % (177)	0.0502
Inflammatory Diseases of the CNS (326 -326)	0.15 % (31)	0.09 % (5)	-0.0189
Injury & Poisoning (999 -999)	5.85 % (1238)	7.61 % (429)	0.0701
Ischemic Heart Disease (414 -414)	18.0 % (3815)	20.9 % (1180)	0.0731
Mental Disorders (319 -319)	11.2 % (2365)	11.6 % (653)	0.0126
Muscular Dystrophies (359 -359)	0.22 % (46)	0.07 % (4)	-0.0386
Musculoskeletal System and Connective Tissue (739 -739)	41.7 % (8823)	35.3 % (1992)	-0.1314
Neoplasms (239 -239)	9.35 % (1978)	14.8 % (834)	0.1676
Disorder of the Nervous System (389 -389)	2.94 % (623)	3.01 % (170)	0.0041
Other Forms of Heart Disease (429 -429)	20.7 % (4384)	23.8 % (1342)	0.074
Parkinsons Disease (332 -332)	2.96 % (627)	1.74 % (98)	-0.081
Disorder of the Peripheral Nervous System (358 -358)	1.71 % (361)	2.02 % (114)	0.0233
Diseases of the Respiratory System (519 -519)	13.7 % (2900)	16.2 % (912)	0.0692
Multiple Sclerosis (340 -340)	0.82 % (174)	1.03 % (58)	0.0215
Diseases of the Skin and Subcutaneous Tissue (709 -709)	5.37 % (1137)	8.64 % (487)	0.128

* Means are presented with Standard Deviations or Counts in parenthesis

** Rows are highlighted when the magnitude of the Standardized Difference is greater than 0.1

Baseline Characteristics: After Propensity Score Matching

	Physical Therapy (5501)	No Physical Therapy (5501)	Standardized Difference
Demographics			
Age	71.8 (15.6)	71.6 (15.5)	-0.0087
Male (%)	37.8 % (2082)	38.5 % (2118)	0.0135
Language Spoken			
English (%)	63.1 % (3472)	63.6 % (3497)	0.0094
Spanish (%)	17.2 % (945)	16.7 % (916)	-0.0141
Referral Source			
Hospital (%)	82.0 % (4510)	81.9 % (4508)	-9e-04
Physician (%)	1.00 % (55)	0.95 % (52)	-0.0056
Nursing Home (%)	5.64 % (310)	5.20 % (286)	-0.0193
Other (%)	11.4 % (626)	11.9 % (655)	0.0164
General Health Status			
Regimen Change Prior to Admission (%)	66.8 % (3672)	66.7 % (3670)	-8e-04
Primary Caregiver			
Primary Care Giver Identified	79.3 % (4361)	80.1 % (4408)	0.0212
No Primary Care Giver Identified	20.7 % (1140)	19.9 % (1093)	-0.0212
Sensory Status			
Severity of Pain (0-3)	1.04 (1.00)	1.04 (1.00)	-0.0078
Respiratory			
Dyspnea (0-4)	0.84 (0.99)	0.84 (1.00)	-0.0037

* Means are presented with Standard Deviations or Counts in parenthesis

** Rows are highlighted when the magnitude of the Standardized Difference is greater than 0.1

Example: Formatting & Page Layout (cont'd)

```
ttl = "Baseline Characteristics: Before Propensity Score Matching"
ttl2 = "Baseline Characteristics: After Propensity Score Matching"
fn = c("* Means are presented with Standard Deviations or Counts in parenthesis",
      "** Rows are highlighted when the magnitude of the Standardized Difference is greater
      than 0.1")
hdr = header.param(margins=c(.75, .25),
                  text1=c("The Effect of Physical Therapy on Adult Acute Care Patients"),
                  text2="NOT CONFIDENTIAL")
ftr = footer.param(margins=.5, text1=c("VNSNY: The Center for Home Care", "Policy & Research"),
                  page.text="page")

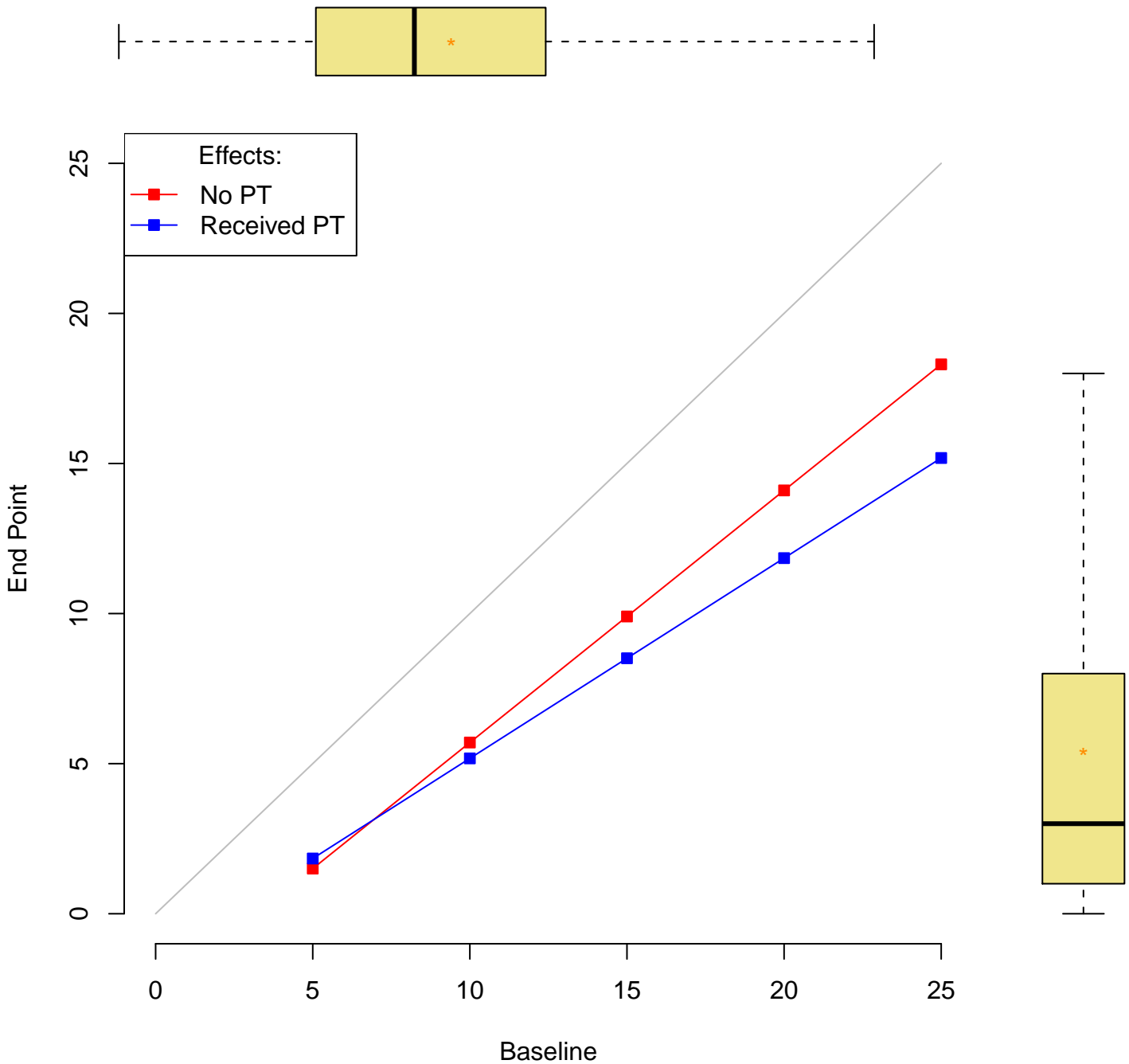
pdf("present_ptmatch.pdf", height=11, width=8.5)
printdevice.report(baseline.adu.tbl, label="LABEL1", group="GROUP1"
                  , style="portrait", margins = c(.5, .5, 1, .5), newpage=TRUE
                  , highlight.row=list(highlight.row=pre.high, col="yellow")
                  , format.tbl = format.tbl(justify="right")
                  , gpar.tbl=gpar.tbl(fontfamily="HersheySans", fontsize=9)
                  , gpar.colnames=gpar.colnames(fontfamily="HersheySans", bg="lightsalmon")
                  , gpar.main=gpar.main(fontsize=12), main = ttl, footnote = fn, header.param = hdr
                  , footer.param = ftr) -> tbl.before.pos

printdevice.report(baseline.matched.adu.tbl, label="LABEL1", group="GROUP1"
                  , style="portrait", margins = c(.5, .5, 1, .5), newpage=TRUE
                  , highlight.row=list(highlight=post.high, col="yellow")
                  , format.tbl = format.tbl(justify="left") ,fit.width=TRUE
                  , gpar.tbl=gpar.tbl(fontfamily="HersheySans", fontsize=9)
                  , gpar.colnames=gpar.colnames(fontfamily="HersheySans", bg="powderblue")
                  , gpar.main=gpar.main(fontsize=12), main = ttl, footnote = fn, header.param = hdr
                  , footer.param = ftr, lasttable=tbl.before.pos) -> tbl.before.pos
```

ANCOVA: ADL Severity Score

	Sum of Squares	Mean Square	F-value	p-value
No Physical Therapy	765.6	765.6	39.3	<.0001
Baseline ADL Severity	155576	155576	7987.8	<.0001
No Physical Therapy * Baseline ADL Severity	2044.4	2044.4	105	<.0001

ADL Severity Least Square Means (0–33) by Physical Therapy Status



Example: Table & Plot

```
ht <- 11; wt <- 8.5; tbl.space <- 3; sct.plt = .8;
y.sct.plt <- sct.plt*wt/ht; y2.sct.plt <- (11-tbl.space)/ht
par(fig=c(0,sct.plt,0,y.sct.plt), mai = c(1.5, 1.25, 0, 0), new=TRUE)
plot.ancova.lsm(v0 = lsm.adlsev$LSE_MEAN0[1:5], v1 = lsm.adlsev$LSE_MEAN1[1:5],
               v = lsm.adlsev$VALUE[1:5], xlim = c(0, 25), ylim = c(0, 25),
               at.x = 5*(0:5), at.y = 5*(0:5), xlab = "Baseline", ylab = "End Point")
lines(x= c(0, 25), y = c(0, 25), col = "grey")
# Box Plot on Right
par(fig=c(sct.plt, 1, 0, y.sct.plt), new=TRUE, mai = c(1.5, 0, 0, .25))
boxplot(matched.adu$ADLSEVERITY_END, axes=FALSE, ylim = c(0, 25), col = "khaki",
         outline = FALSE)
points(y=mean(matched.adu$ADLSEVERITY_END, na.rm = TRUE), x=1, ylim = c(0, 25),
       pch = "*", col = "dark orange")
# Top Box Plot
par(fig=c(0, sct.plt, y.sct.plt, y2.sct.plt), mai = c(0, 1, 0, 0), new=TRUE)
boxplot(matched.adu$ADLSEVERITY_BEG, horizontal=TRUE, axes=FALSE, ylim = c(0, 25),
       col = "khaki", outline = FALSE)
points(x=mean(matched.adu$ADLSEVERITY_BEG, na.rm = TRUE), 1, pch = "*",
       col = "dark orange")
mtext("ADL Severity Least Square Means (0-33) by Physical Therapy Status", side=3,
      outer=TRUE, line=-16, cex = 1, font = 2)
printdevice.report(ancova.adlsever, label = "Effect", style = "portrait",
                  margins=c(1.25,1), main = "ANCOVA: ADL Severity Score",
                  fit.width=TRUE, gpar.tbl=gpar.tbl(fontfamily="HersheySans"),
                  header.param = hdr, footer.param = ftr,
                  pagenum=tbl.before.pos$end.pagenum+1)

dev.off()
```

Example: Wrapper for lm

Regression Analysis on Freeny's Quarterly Revenue Data

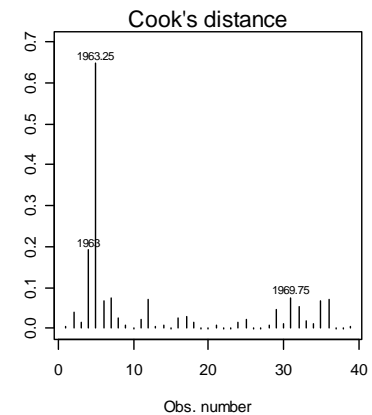
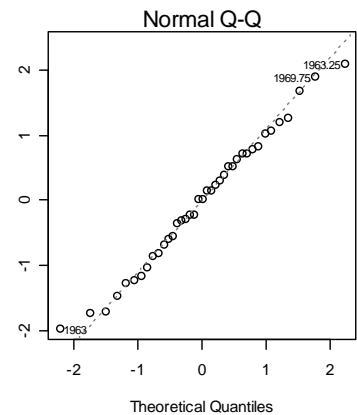
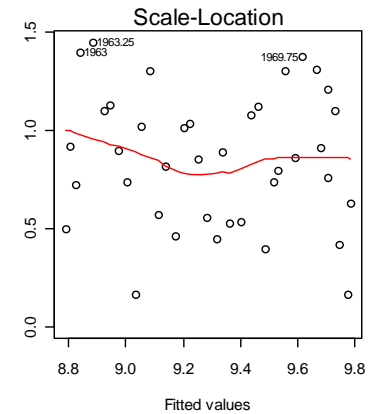
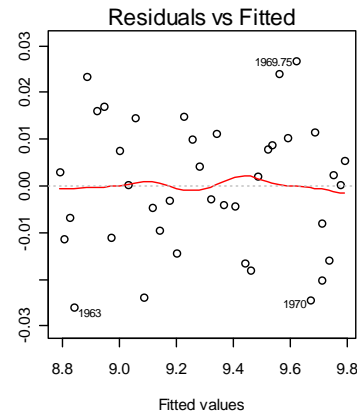
Parameter Estimates

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	-10.47	6.02	-1.74	0.09
lag.quarterly.revenue	0.12	0.14	0.87	0.39
price.index	-0.75	0.16	-4.69	0
income.level	0.77	0.13	5.73	0
market.potential	1.33	0.51	2.61	0.01

Model Summary Statistics

Residual Standard Error	R-Squared	Adj. R-Squared
0.01	0.9981	0.9978

F Value	Num DF	Den DF	Pr(>F)
4354.25	4	34	0



Example: Wrapper for `lm` (cont'd)

```
printdevice.lm( y ~ ., data = freeny, which.plots =1:4, main = "Regression  
Analysis on Freeny's Quarterly Revenue Data")
```

Conclusion

- ❑ This approach finds a niche between copying output from the R console and creating a type setting document
- ❑ Can be used with any application that mixes text and graphics
- ❑ Future development:
 - Conditional formatting of fonts
 - Additional formatting for more than two dimensions in rows or columns
 - More wrappers (`xtabs`, **reshape** package, `glm`, `aov`, etc.)

Thank You
