

Auditing the Rheumatology Backlog

Dominik Kurzeja

26/11/2021

Auditing the Backlog

We have now completed three audit cycles of the Rheumatology outpatients backlog - based on the “status date” (or date of last encounter) of the patients waiting for follow up appointments on the 17th September (*C1*), 17th October 2021 (*C2*) and 17th November 2021 (*C3*).

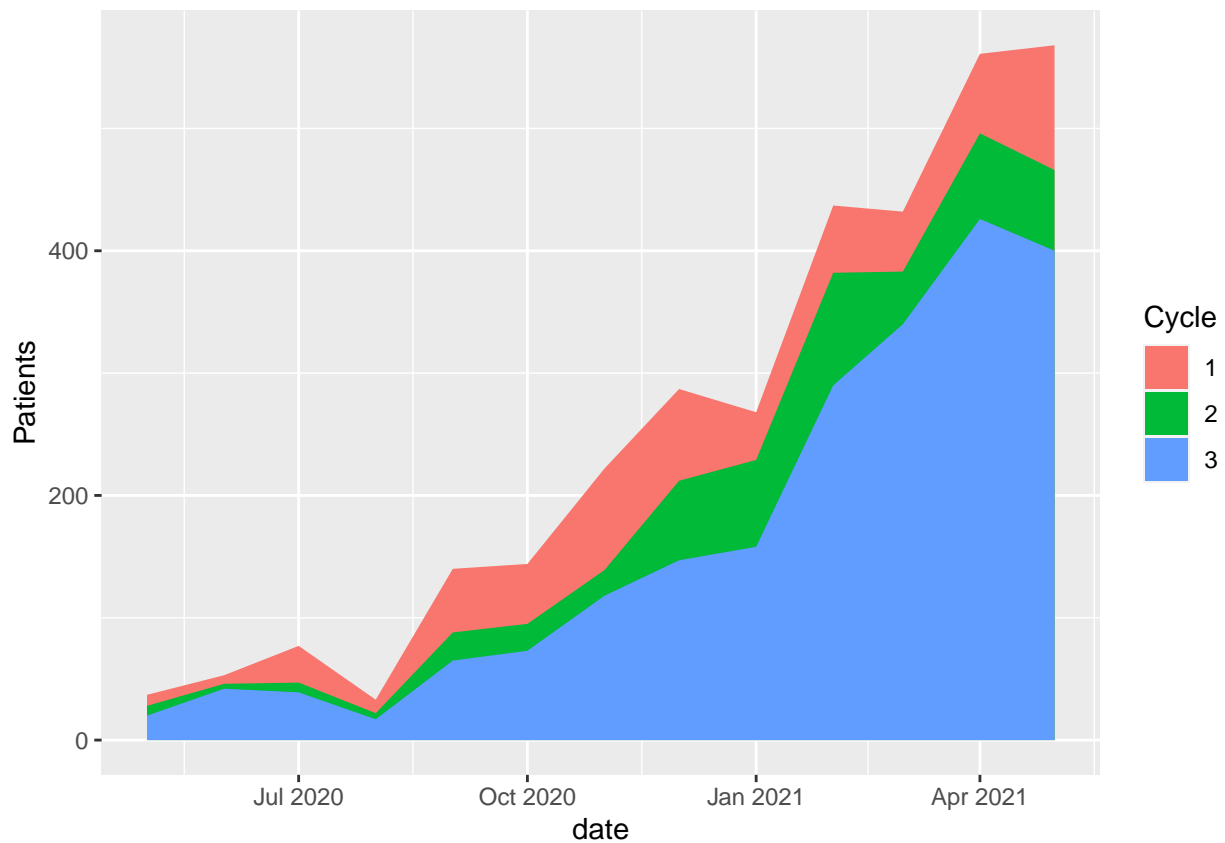
This is the raw data for this - abbreviated to just include the number of patients with a status date between in the 13 month May 2020 - May 2021 period of interest.

mon	year	C1	C2	C3
may	2020	37	28	20
jun	2020	53	46	42
jul	2020	77	47	39
aug	2020	33	22	17
sep	2020	140	88	65
oct	2020	144	95	73
nov	2020	222	139	118
dec	2020	287	212	147
jan	2021	268	229	158
feb	2021	437	382	290
mar	2021	432	383	340

mon	year	C1	C2	C3
apr	2021	561	496	426
may	2021	568	466	400

Graphs

We can visually represent the number of patients left on the backlog in each month of the period using a ridge-line plot, which also shows how this has reduced over each cycle of the audit:



Statistics

We can explore whether the change in the number of patients on the backlog during this period is statistically significant in a couple of different ways.

Comparing across months

Firstly a **Wilcoxon Sign Rank** test (for multiple groups of non-parametric data) on the dataset, comparing the number of patients in each month in the first, second and third cycles of the audit:

Firstly an unpaired test:

.y.	group1	group2	n1	n2	statistic	p	p.adj	p.adj.signif
patients	1	2	17	17	164	0.518	0.518	ns
patients	1	3	17	13	159	0.043	0.130	ns
patients	2	3	17	13	149	0.113	0.226	ns

And a paired test:

.y.	group1	group2	n1	n2	statistic	p	p.adj	p.adj.signif
patients	1	2	17	17	164	0.518	0.518	ns
patients	1	3	17	13	159	0.043	0.130	ns
patients	2	3	17	13	149	0.113	0.226	ns

This shows that there is no statistically significant difference between the medians and distribution of patients between months in the May 20 - May 21 period when the number of patients in each month is listed separately.

Comparing the total number of patients

An alternative method is to compare the *total* number of patients on the backlog at the time of each of the three cycles; this is an effective comparison of the “area under the curve” at each of these time points (“C1”, “C2” and “C3”).

C1	C2	C3
3259	2633	2135

This can be performed with a **Chi-squared** test:

Unpaired test:

n	statistic	p	df	method	p.signif
8027	237.1068	0	2	Chi-square test	****

Var1	observed	prop	expected	resid	std.resid
A	3259	0.4060047	2675.667	11.2771872	13.811677
B	2633	0.3280179	2675.667	-0.8248457	-1.010225
C	2135	0.2659773	2675.667	-10.4523415	-12.801452

Pairwise comparison:

n	group1	group2	statistic	p	df	p.adj	p.adj.signif
5892	C1	C2	66.50984	0	1	0	****
5394	C1	C3	234.21876	0	1	0	****
4768	C2	C3	52.01426	0	1	0	****

Therefore there is a statistically significant difference between the number of the patients on the backlog during this period at each of the three time points.

Testing for trend

Additionally we can calculate the **Cochran-Armitage test** (a Chi-squared test for linear trends in changing proportions) with the assumption of the same proportion of patients in each month in each cycle:

First construct a table:

	C1	C2	C3
may 2020	37	28	20
jun 2020	53	46	42
jul 2020	77	47	39
aug 2020	33	22	17
sep 2020	140	88	65
oct 2020	144	95	73
nov 2020	222	139	118
dec 2020	287	212	147
jan 2021	268	229	158
feb 2021	437	382	290
mar 2021	432	383	340
apr 2021	561	496	426
may 2021	568	466	400

Then we perform the test:

n	statistic	p	p.signif	df	method
8027	19.44781	1.03e-05	****	1	Chi-square trend test

This shows a highly statistically significant possible linear association between cycle and patients in each month