



# IRT GOLD Analysis



South, Central and West  
Commissioning Support Unit

**Customer:** Paul Swan & IRT Project Group  
**Organisation:** Oxfordshire Clinical Commissioning Group

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### Request Details:

The aim of this report is to understand if the IRT service had an impact on non-elective admissions / re-admissions for patients who have had contact with the IRT service. This analysis uses sample data from the IRT and Non-IRT areas and is broken down by patient GOLD scores (COPD severity level) to ensure that we are evaluating comparable patients.

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<b>Data Source:</b>	SUS Inpatients	<b>Provider(s):</b>	All
<b>Date Period:</b>	April 2015 - February 2020	<b>Commissioner(s):</b>	Oxfordshire Clinical Commissioning Group

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### Methodology/Data Inclusions and Exclusions:

Only non-elective admissions categorised under the Updated Focus Cohort are extracted from SUS inpatient data for the patients included in each of the samples.

Please take note of the caveats and data source information given in Annex 1 and 2.

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If you wish to contact us to discuss this report or its content please use the contact details below:

<b>Analyst:</b>	[REDACTED]	<b>Email Address:</b>	scwcsu.analytics.bobb@nhs.net
<b>Date Completed:</b>	01/12/2020		

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### Data Sharing Governance Statement:

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Methodology

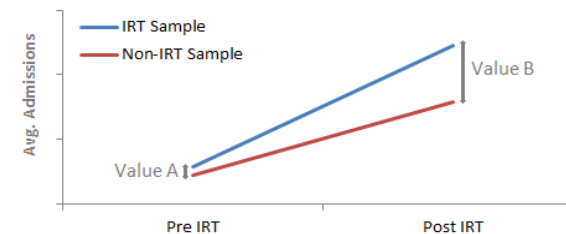
Two samples of patients with known GOLD scores were collected for this analysis. The IRT sample included a list of patients who had experienced direct contact with the IRT service (on the Virtual Wards list) and were also listed on the national COPD audit database. This sample was extracted by starting at the top of the Virtual Wards list (produced at the beginning of the IRT project) and worked down until there was a sufficient sample size for each GOLD category. The Non-IRT sample included a list of patients who were located in the Non-IRT area and were also on the national COPD audit database. This sample was extracted from a wider range of patients who were admitted in a longer time period. These samples were then reduced down so that the sample sizes matched for each GOLD category score, and any duplicate NHS numbers were removed. The IRT sample originally contained a list of 135 patients and the Non-IRT sample contained a list of 139. These samples were reduced to 123 patients, 43 for the moderate category, 41 for the severe category, 39 for the very severe category GOLD scores.

GOLD Category	Sample Sizes	
	IRT Sample	Non-IRT Sample
Moderate	43	43
Severe	41	41
Very Severe	39	39
<b>Total</b>	<b>123</b>	<b>123</b>

Both patient samples were matched to corresponding non-elective admissions into hospital for each patient and data was extracted for those admissions which fell under the Updated Focus cohort coding. A difference in difference estimation was then used to evaluate the impact of the IRT service on admissions and re-admissions for the sample patients. The methodology used differs slightly from the primary evaluation in that the average number of admissions per month are looked at for pre and post IRT initiation. This is to take into account the differing time periods used to select the patient samples in each area. Any change in the difference between the IRT and Non-IRT samples, between pre and post-IRT, was then observed and evaluated using a test for significance to determine the likelihood of any notable changes in the measure being attributed to the IRT project intervention or natural trend / variation.

Observations

Each GOLD stage severity category, for both the IRT and Non-IRT samples, saw an increase in average number of admissions and re-admissions post IRT. Due to the nature of COPD, an increase in admissions may have been expected, so we are instead interested in the difference between the IRT and Non-IRT samples pre-IRT and how this compares to the difference post IRT (how value A compares to value B in the example chart to the right of this text). If the difference between the two samples increased/decreased by a significant amount, we would conclude that the change in admissions was due to the IRT service implementation.



For both the moderate and very severe category samples, a minor change in the difference in average admissions was observed between the IRT and Non-IRT samples. In comparison, a larger change in the difference in average admissions was observed for the severe category. For this severity category, the IRT sample increased more than the Non-IRT sample post IRT, this can be observed on the middle charts on the Analysis tab. Although this observation might lead one to suggest that the IRT intervention had caused an increase in admissions for the severe category, the test for significance indicated that this was not a significant change. Furthermore, the differences between the two groups for both admissions and re-admissions were tested, for all GOLD categories, and no significant change was detected (see Annex 3 for details on significance testing). This leads us to conclude that the IRT intervention had no impact on the difference in outcome between the IRT and non-IRT samples.

**Admissions and Re-admissions for Pre and Post IRT Intervention**

Pre-IRT Intervention is pre December 2018 (same time period used for baseline in primary evaluation)

Data shown is for April 2015 to February 2020

Admissions				Re-admissions			
Moderate	IRT Sample	Non-IRT Sample	Difference	Moderate	IRT Sample	Non-IRT Sample	Difference
Pre IRT	55	42	13	Pre IRT	16	9	7
Post IRT	74	78	-4	Post IRT	27	30	-3
Severe	IRT Sample	Non-IRT Sample	Difference	Severe	IRT Sample	Non-IRT Sample	Difference
Pre IRT	69	59	10	Pre IRT	34	19	15
Post IRT	95	71	24	Post IRT	33	16	17
Very Severe	IRT Sample	Non-IRT Sample	Difference	Very Severe	IRT Sample	Non-IRT Sample	Difference
Pre IRT	138	51	87	Pre IRT	53	6	47
Post IRT	109	75	34	Post IRT	48	29	19

**Admissions and Re-admissions for Pre and Post IRT Intervention (averaged by number of months in time period)**

Pre-IRT Intervention is pre December 2018 (same time period used for baseline in primary evaluation)

Data shown is for April 2015 to February 2020

Admissions				Re-admissions			
Moderate	IRT Sample	Non-IRT Sample	Difference	Moderate	IRT Sample	Non-IRT Sample	Difference
Pre IRT	1.25	0.95	0.30	Pre IRT	0.36	0.20	0.16
Post IRT	4.93	5.20	-0.27	Post IRT	1.80	2.00	-0.20
Severe	IRT Sample	Non-IRT Sample	Difference	Severe	IRT Sample	Non-IRT Sample	Difference
Pre IRT	1.57	1.34	0.23	Pre IRT	0.77	0.43	0.34
Post IRT	6.33	4.73	1.60	Post IRT	2.20	1.07	1.13
Very Severe	IRT Sample	Non-IRT Sample	Difference	Very Severe	IRT Sample	Non-IRT Sample	Difference
Pre IRT	3.14	1.16	1.98	Pre IRT	1.20	0.14	1.07
Post IRT	7.27	5.00	2.27	Post IRT	3.20	1.93	1.27

**Supplementary Narrative**

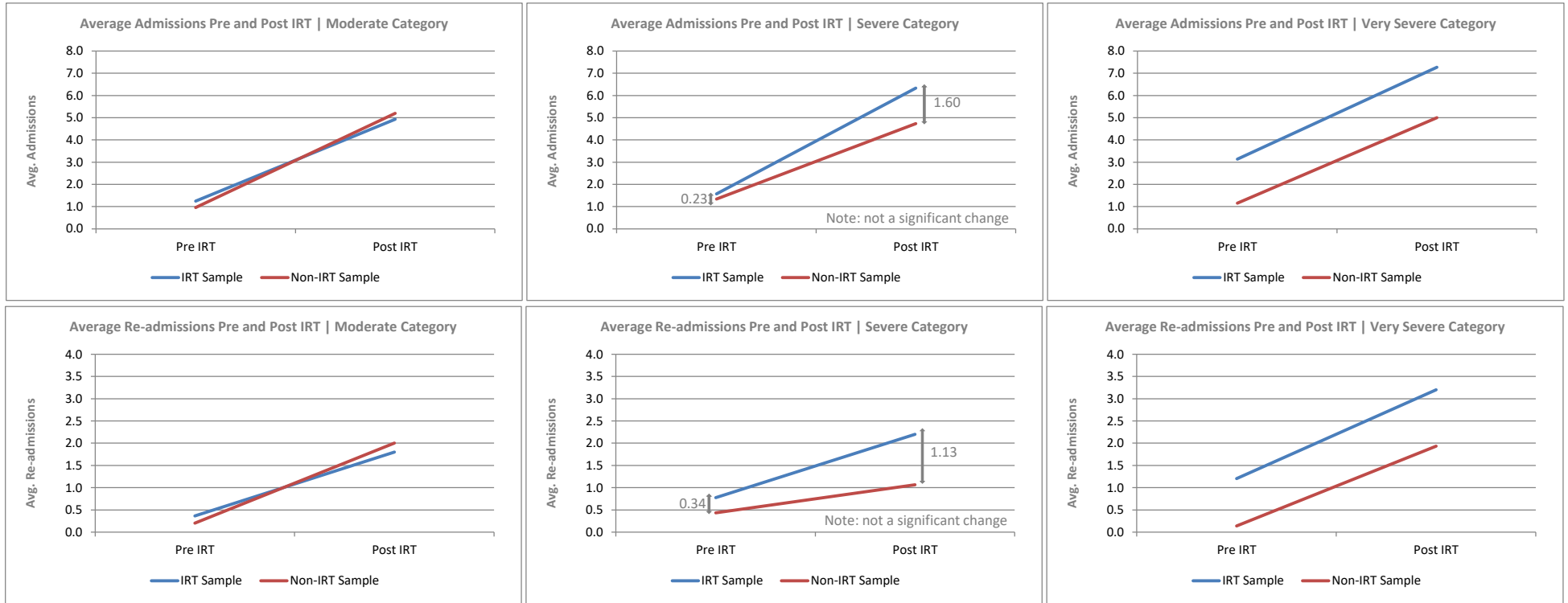
When observing the tables and charts in this document it is important to look at the **change in the difference** between the IRT and Non-IRT samples. This means not comparing whether the IRT or Non-IRT areas have seen an increase (as they both might have) but instead looking at the difference between the two groups and how this changed over time. This will indicate whether any change has been due to the IRT service rather than natural change in trend.

The first set of tables to the left show the number of admissions and re-admissions for both samples of patients, but as the time periods differ for pre and post IRT, it is important that we weight the data by the number of months in the time period (produce an average).

The second set of tables to the left show the average number of admissions and re-admissions per month for pre and post IRT intervention.

Observing the change in the difference between pre and post-IRT intervention, the severe GOLD category stands out. There was a larger change observed in the difference between the two groups for the severe category when compared to the moderate and very severe categories. This is clear to see from the charts below. Although both the IRT and Non-IRT samples saw an increase in average admissions, the IRT sample increased by a larger percentage than the Non-IRT area for the severe category. Although this might lead one to suggest that the IRT intervention had caused an increase in admissions, the test for significance indicated that this was not a significant change.

Charts - Admissions and Re-admissions for Pre and Post IRT Intervention (averaged by number of months in time period)



Please take note of the below caveats when reviewing this report.

1. The samples for the IRT and Non-IRT areas are a subgroup and we are not looking at the entire COPD population.
2. This report is looking at the effect that the IRT service had on patients who were known to have been seen by the IRT service. The evaluation of the expanded, updated focus, COPD and asthma cohorts (separate target cohorts) is presented separately in the primary evaluation.
3. The samples for the IRT and Non-IRT areas were selected by the lead IRT nurse and the lead IRT consultant. The IRT sample included a list of patients who had experienced direct contact with the IRT service (on the Virtual Wards list) and were also listed on the national COPD audit database. This sample was extracted by starting at the top of the Virtual Wards list (produced at the beginning of the IRT project) and worked down until there was a sufficient sample size for each GOLD category. The Non-IRT sample included a list of patients who were located in the Non-IRT area and were also on the national COPD audit database. This sample was extracted from a wider range of patients who were admitted in a longer time period.
4. Please note not all patients who are included in the patient samples will have had admissions/re-admissions each month.

Measure	Source	Methodology/Data Inclusions and Exclusions
Non-Elective Admissions	SUS Inpatient Spells	NHS ID Matches with patient samples. In updated focus cohort (see below for criteria) Commissioner Oxfordshire CCG NHS Patients only (excludes private patients) Non-elective admissions only Age > 17 [REDACTED]
Re-admissions	SUS Inpatient Spells	As above with the addition: Readmissions are defined as patients with a recorded NHS Number having another non-elective admission <b>within 30 days of discharge</b> . The clinical cohort for these patients are defined using the readmission spell coding.

Inpatient Spells - Updated Focus Cohort	
Primary diagnosis of:	AND Secondary diagnosis of:
Respiratory Infection (contains Bronchitis, Pneumonia, Upper Respiratory Tract Infection, Lower Respiratory Tract Infection)	Asthma, Bronchiectasis, Bronchitis, COPD, Emphysema, Interstitial Lung Disease, Sarcoidosis and Wheezing
Sepsis	Asthma, Bronchiectasis, Bronchitis, COPD, Emphysema, Interstitial Lung Disease, Sarcoidosis and Wheezing
Abnormalities of breathing (contains wheezing and cough)	Asthma, Bronchiectasis, Bronchitis, COPD, Emphysema, Interstitial Lung Disease, Sarcoidosis and Wheezing
COPD (contains Emphysema)	Any (no restriction)
Asthma	Any (no restriction)
Bronchiectasis	Any (no restriction)
ILD	Any (no restriction)
Sarcoidosis	Any (no restriction)

Methodology

The test for significance in this report uses z-scores. As we are assuming that the data is normally distributed, these scores allow us to understand how far away from the mean the observations are and thus calculate the probability of that observation occurring by chance. These probabilities are known as P-values and are obtained from the z-scores. P-values give you an indication of whether to accept or reject the null hypothesis, of which for this test is:

NO: "There is no change in the difference in average admissions between the IRT and Non-IRT groups post IRT Intervention (no impact of IRT intervention on difference in outcome between the IRT and non-IRT groups) ".

A small P value of much less than 0.05 indicates strong evidence against the null hypothesis. This would mean that we can reject the null hypothesis.  
 A large P value of greater than 0.05 indicates no evidence against the null hypothesis. This would mean that the null hypothesis cannot be rejected.  
 A P value which is very close to 0.05 is considered to have marginal evidence for or against the null hypothesis and produces an inconclusive result.

Results for Difference in Average Admissions

Pre vs Post IRT	Moderate			Severe			Very Severe		
	IRT Sample	Non-IRT Sample	Difference	IRT Sample	Non-IRT Sample	Difference	IRT Sample	Non-IRT Sample	Difference
Difference in means	3.68	4.25	-0.56	4.77	3.39	1.37	4.13	3.84	0.29
SD for difference in means	0.55	1.26	1.37	0.85	0.98	1.30	1.02	1.13	1.52
		<b>Z-score:</b>	-0.4099		<b>Z-score:</b>	1.0571		<b>Z-score:</b>	0.1902
		<b>P-value:</b>	0.6819		<b>P-value:</b>	0.2904		<b>P-value:</b>	0.8491

Results for Difference in Average Re-admissions

Pre vs Post IRT	Moderate			Severe			Very Severe		
	IRT Sample	Non-IRT Sample	Difference	IRT Sample	Non-IRT Sample	Difference	IRT Sample	Non-IRT Sample	Difference
Difference in means	1.44	1.80	-0.36	1.43	0.63	0.79	2.00	1.80	0.20
SD for difference in means	0.35	0.57	0.67	0.44	0.40	0.60	0.59	0.58	0.83
		<b>Z-score:</b>	-0.5333		<b>Z-score:</b>	1.3187		<b>Z-score:</b>	0.2400
		<b>P-value:</b>	0.5938		<b>P-value:</b>	0.1873		<b>P-value:</b>	0.8103

No P-values are less than 0.05, thus no significance was detected for the change in the difference in admissions between the IRT and Non-IRT groups post IRT Intervention.

SD = Standard Deviation