Report 11

Audit of ED COVID-19 Coding

By

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Version 3.1

Table of Contents

Table of Figures

List of Tables

1 Data source & preparation

On 23rd June 2021 I was given access to a substantial TXT file (22MB) held on a shared Google drive entitled XXXX_20210101_ToDate.txt[1], this being a dump of electronic records of admissions for the period 1st January 2021 – 13th June 2021 for an unknown NHS Trust. When imported into Excel this consisted of 161,495 rows with the following headings ranging from columns A to L:

Arrival_Date, Age_at_CDS_Activity_Date, FirstJabDate, SecondJabDate, Within28d_FirstJab, Within28d_SecondJab, Chief_Complaint, Diag1, Diag2, Diag3, Diag4, Discharge_Dest

All variables were extracted from the file for the purpose of recoding and analysis. A coding frame may be found in the appendix.

1.1 Clinical Diagnostic Coding

The four 'Diag' fields contained non-ICD10 diagnostic text in strings up to 80 characters long. The automatic recode feature of IBM SPSS was utilised to generate a common-coded listing in alphanumeric order resulting in 867 unique entries covering all admission diagnoses made. Excel's string search function was then utilised to flag records for key conditions relating to COVID-19 including all respiratory diagnoses, all cardiac diagnoses, thrombocytopenia, intravascular coagulation, thrombosis, pulmonary embolism and intracranial haemorrhage – a full listing of diagnoses may be found in section 3.1.

Primary indicator variables (0=absence; 1=presence) for categories of diagnoses made across all four diagnostic fields were established to facilitate statistical analysis. Cases were indexed and time delays from first and second dosing to admission were recalculated from scratch.

2 Background

In table 3 of report 8 – *Vaccination Status & Incidence of COVID-19* we observed some 38.2% of COVID-19 admissions being discharged back home; a finding that was deemed 'striking'. In section 3.1 of report 7 – *Mortality Analysis* we observed lack of a correlation between certain diagnoses of

[1] Filename has been partly anonymised.

interest[2] and onset of the pandemic as well as complete lack of mention of hypoxia in any of the 51,290 records of deceased patients. In section 3.2 of report 7 we observed lack of a correlation between certain clinical markers of COVID-19[2] and incidence of the disease. In section 3.3 of report 7 we observed lack of a correlation between the combination of four indicator variables (**Dx_PERI**, **Dx_AMI**, **Dx_CLOT**, **Dx_BLOOD**) spanning a range of 29 relevant diagnoses and onset of the pandemic, with the conclusion that this was "*yet another curious result that does not fall in line with expectation*".

In table 4 of report 7 we observed a crosstabulation of 26 combined diagnoses of concern against COVID designation with the finding that non-COVID deaths were associated with a higher rate for diagnoses attributed to severe SARS-COV-2 infection (7.9%) than COVID-19 designated deaths; this difference being highly statistically significant (comparison of proportions: chi-square = 53.51, 1df, $p<0.001$). I ended the section by stating…

'This is quite an extraordinary situation. Instead of replicating the results of Barda et al I am forced to conclude that well-established diagnoses of concern – a list of some 26 diagnoses - did not feature among deaths designated as COVID-19 by the NHS Trust concerned. Just how are they going about coding COVID-19 deaths, and all COVID cases for that matter? Precious little makes sense.'

…before revealing lack of correspondence between incidence of respiratory failure, deep vein thrombosis and intracranial haemorrhage with onset of the pandemic in sections 3.3.1 and 3.3.2 of the same report.

These observations prompted me to answer my own question and take a look at the raw diagnostic field data held within XXXX_20210101_ToDate.txt.

2.1 Diagnostic field entries

The 161,494 emergency department admissions records of XXXX_20210101_ToDate.txt were sorted in alphanumeric order by the field Chief_Complaint, with a filter applied to the field Diag1 to display all records with the text entry 'Disease caused by 2019 novel coronavirus'. A screenshot of the first 23 entries in the sorted and filtered spreadsheet in this manner is provided as Figure 1

[2] Idiopathic thrombocytopenic purpura; disseminated intravascular coagulation; respiratory failure

Figure 1: Screenshot of XXXX_20210101_ToDate.txt after sort & filter

	A	B	C	D	E	F
1	SEQ	Chief_Complaint	Diag1	Diag2	Diag3	Diag4
38323	735	AP - Abdominal pain	Disease caused by 2019 novel coronavirus			
38324	877	AP - Abdominal pain	Disease caused by 2019 novel coronavirus			
38325	878	AP - Abdominal pain	Disease caused by 2019 novel coronavirus			
38326	2440	AP - Abdominal pain	Disease caused by 2019 novel coronavirus			
38327	2441	AP - Abdominal pain	Disease caused by 2019 novel coronavirus			
38328	4217	AP - Abdominal pain	Disease caused by 2019 novel coronavirus			
38329	5942	AP - Abdominal pain	Disease caused by 2019 novel coronavirus			
38330	5943	AP - Abdominal pain	Disease caused by 2019 novel coronavirus			
38331	8116	AP - Abdominal pain	Disease caused by 2019 novel coronavirus	Infectious gastroenteritis (disorder)		
38332	8856	AP - Abdominal pain	Disease caused by 2019 novel coronavirus			
38333	9771	AP - Abdominal pain	Disease caused by 2019 novel coronavirus	Gastritis (disorder)		
38334	11289	AP - Abdominal pain	Disease caused by 2019 novel coronavirus	Infectious gastroenteritis (disorder)		
38335	13512	AP - Abdominal pain	Disease caused by 2019 novel coronavirus			
38336	15120	AP - Abdominal pain	Disease caused by 2019 novel coronavirus			
38337	15796	AP - Abdominal pain	Disease caused by 2019 novel coronavirus	Cellulitis (disorder)		
38338	16579	AP - Abdominal pain	Disease caused by 2019 novel coronavirus			
38339	16750	AP - Abdominal pain	Disease caused by 2019 novel coronavirus			
38340	16751	AP - Abdominal pain	Disease caused by 2019 novel coronavirus			
38341	18170	AP - Abdominal pain	Disease caused by 2019 novel coronavirus			
38342	18289	AP - Abdominal pain	Disease caused by 2019 novel coronavirus			
38343	19726	AP - Abdominal pain	Disease caused by 2019 novel coronavirus			
38344	19727	AP - Abdominal pain	Disease caused by 2019 novel coronavirus			
38345	20621	AP - Abdominal pain	Disease caused by 2019 novel coronavirus	Pyelonephritis (disorder)		

We observe 23 instances of admissions reporting abdominal pain, with four diagnoses made of Infectious gastroenteritis, Gastritis, Infectious gastroenteritis, Cellulitis and Pyelonephritis. To say this came as a shock is an understatement. The screenshot was shared with a trusted general practitioner and our conclusion was that we are looking at instances of positive test results that have no inherent clinical meaning – either these cases were asymptomatic admissions for non-COVID reasons or the results were false positives. Concerned by these findings I decided to establish a method of determining declared COVID admissions with supporting diagnostic evidence as opposed to COVID admissions with no supporting evidence.

3 Reference framework

3.1 Supporting diagnoses

COVID-19 is primarily held to be a respiratory disease and thus all respiratory and related diagnoses made within XXXX_20210101_ToDate.txt were tagged using the indicator Dx_RESP (Table 1). However, there are certain acknowledged and most particular conditions arising from severe SARS-

COV-2 infection that also serve as useful clinical markers3, thus a secondary indicator (Dx_COMP) was established regarding elevated incidence of myocarditis, pericarditis, arrhythmia, deep-vein thrombosis, pulmonary embolism, myocardial infarction, intracranial haemorrhage, and thrombocytopenia (Table 2).

Between them these two indicator variables were considered as providing supporting diagnostic evidence of a genuine SARS-COV-2 infection leading to COVID-19 with sufficient symptomatic severity as to warrant ED admission.

Table 1: ED diagnosis listing for Dx_RESP

Aspiration pneumonia (disorder)
Lobar pneumonia (disorder)
Lower respiratory tract infection (disorder)
Pneumonia
Respiratory arrest
Respiratory failure without hypercapnia (disorder)
Type II respiratory failure
Upper respiratory infection
Viral wheeze (disorder)

Table 2: ED diagnosis listing for Dx_COMP

Acute non-ST segment elevation myocardial infarction	Long QT syndrome
Acute ST segment elevation myocardial infarction	Myocarditis
Atrial fibrillation	PE - Pulmonary embolism
Blood coagulation disorder	Pericarditis
Bradycardia	Postural orthostatic tachycardia syndrome
Cardiac arrest	Preinfarction syndrome
Cerebral haemorrhage	Premature beats
CVA - Cerebrovascular accident	Subarachnoid haemorrhage
Deep venous thrombosis	Supraventricular tachycardia
Endocarditis	Thrombocytopenic disorder
Henoch-Schonlein purpura	Ventricular pre-excitation
Idiopathic thrombocytopenic purpura	Ventricular tachycardia

[3] Barda et al. Safety of the BNT162b2 mRNA Covid-19 Vaccine in a Nationwide Setting, NEJM August 25, 2021. DOI: 10.1056/NEJMoa2110475

3.2 Chief Complaint

There remains the issue of the chief complaint. The 161,494 emergency department admissions records within XXXX_20210101_ToDate.txt yielded a total of 140 unique complaints ranging from 'Abrasion' to 'Wound Care (procedure)'. These were assessed for likely relevance to SARS-COV-2 infection/COVID-19. The resulting complaint shortlist of 26 entries is given as Table 3. The indicator variable **COVcomp** was established to assist with record identification.

Table 3: Chief complaint listing likely relevant to COVID

Asthenia
Backache (finding)
Cardiac arrest (disorder)
Cardiac arrest due to trauma
Chest pain (finding)
Clouding of consciousness
Cough (finding)
Crying infant
Cyanosis (finding)
Difficulty breathing (finding)
Dizziness (finding)
Dyspnea
Fever (finding)
Headache
Hemoptysis
Hiccoughs
Hospital admission, emergency, direct (procedure)
Loss of appetite (finding)
Loss of sensation
Nasal congestion
Pale complexion
Palpitations (finding)
Respiratory arrest
Sore throat symptom
Spontaneous bruising (disorder)
Stridor

3.3 Cross reference procedure

The three indicator variables **Dx_RESP**, **Dx_COMP** and **COVcomp** were used to flag all admission records whose chief complaint matched the listing of Table 3 and whose diagnostic entries matched the listing indicated by **Dx_RESP** or **Dx_COMP.** The objective here was to throw the clinical 'net' as wide as possible to capture all admissions that were presenting with conditions commensurate with *symptomatic* COVID-19 and development of the disease.

4 Preliminary Analyses

A total of 42,238 admissions amongst 161,494 were assessed as presenting with a chief complaint compatible with symptomatic COVID-19 (26.2%) over the period 1st January – 13th June 2021. In comparison some 6,055 (3.7%) were assessed as exhibiting one or more diagnostic markers of SARS-COV-2 infection and 5,339 (3.3%) were found to be exhibiting a respiratory diagnosis.

A crosstabulation of COVID-compatible chief complaint by SARS-COV-2 marker diagnosis is given in Table 4, where we find 4,190/161,494 admissions meeting both criteria (2.6%). This may be compared to the Crosstabulation in Table 5, where we find 4,525/161,494 admissions for a COVID-compatible chief complaint backed by respiratory conditions (2.8%).

Table 4: Crosstabulation of compatible complaint & marker diagnostic

COVID compatible complaint * SARS-COV-2 marker Crosstabulation

Count

		SARS-COV-2 marker		
		No	Yes	Total
COVID compatible complaint	No	117391	1865	119256
	Yes	38048	4190	42238
Total		155439	6055	161494

Table 5: Crosstabulation of compatible complaint & respiratory diagnosis

COVID compatible complaint * Respiratory Crosstabulation

Count

		Respiratory		
		No	Yes	Total
COVID compatible complaint	No	118442	814	119256
	Yes	37713	4525	42238
Total		156155	5339	161494

4.1 Symptomatic vs Asymptomatic COVID

The total number of those presenting with a relevant respiratory diagnosis and a relevant SARS-COV-2 diagnostic marker was 125 (0.08%). A tabulation of audited COVID status is given in Table 6, where we find no supporting diagnostic evidence for 16.0% of declared COVID admissions and only a relevant chief complaint with no supporting relevant diagnosis for 74.3% of declared COVID admissions. When taken together we thus find 90.3% of declared COVID admissions to be totally lacking any reasonable supporting diagnosis.

Table 6: COVID-19 designation

COVID status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No supporting evidence	337	.2	16.0	16.0
	Relevant complaint	1561	1.0	74.3	90.3
	Complaint + respiratory Dx	195	.1	9.3	99.6
	Complaint + respiratory + other Dx	9	.0	.4	100.0
	Total	2102	1.3	100.0	
Missing	Not COVID	159392	98.7		
Total		161494	100.0		

Only 9.7% (204/2,102) of declared COVID admissions arrive with a relevant complaint and at least one relevant respiratory diagnosis. The full complement of a relevant chief complaint, a respiratory diagnosis and an additional diagnosis acknowledged to be associated with SARS-COV-2 infection is observed in only 0.4% of declared COVID admissions. If we take relevant chief complaint with a supporting respiratory diagnosis as the basis for COVID-19 validation we arrive at Table 7, in which we discover only 9.7% (202/2,102) of declared COVID cases upon admission actually exhibit the fundamental basis for the symptomatic disease.

Table 7: COVID-19 audit results

COVID status * Admission COVID Crosstabulation

Count

		Admission COVID		
		Not COVID	COVID-19	Total
COVID status	Not COVID	159392	0	159392
	Asymptomatic	0	1898	1898
	Symptomatic	0	204	204
Total		159392	2102	161494

5 The implication

To date 10 reports have been written totalling 60,799 words of analysis made on 102k electronic records of deceased patients and 898k emergency department admission records. Many conclusions have been drawn from 117 figures and 82 tables. All this work has been based on the assumption that NHS Trusts have been coding incidence of COVID-19 in a diligent manner backed by clinical diagnosis. It is abundantly clear this is not the case and that the electronic patient record system is awash with asymptomatic/false positive admissions requiring care for other diseases and conditions whilst their data record is flagged as 'COVID'.

This dilution of the true clinical picture explains the peculiar results from various analyses undertaken. In effect I've been analysing 90% worth of asymptomatic/false positive admission and death expecting this to yield a sensible story about COVID.

6 Summary of key points

This report contains the results of an investigation of 161,494 admission records for an unknown NHS Trust for the period 1st January 2021 to 13th June 2021 by a former data analyst, Clinical Data Manager and head of Clinical Audit at a busy NHS teaching hospital. Key results of interest are summarised as follows:

1. In previous reports in this series certain peculiarities have been noted regarding the lack of correlation between the onset of the pandemic and certain diagnoses associated with severe SARS-COV-2 infection and development of COVID-19. Both COVID designated deaths and emergency department admissions failed to abide by expectation in terms of outcome and clinical diagnosis. This prompted an audit of 161,494 electronic patient records for admissions to an emergency department.

2. Initial investigation revealed a number of records with the coding '*Disease caused by 2019 novel coronavirus*' that had presented for unrelated complaints (e.g. abdominal pain/gastroenteritis) with no supporting diagnosis for COVID-19. A methodology was thus derived whereby ED respiratory diagnoses and diagnoses with known association with SARS-COV-2 infection were combined with a compatible range of complaints made at presentation. The objective was to throw the clinical 'net' as wide as possible to capture all admissions that were presenting with conditions commensurate with *symptomatic* COVID-19 and development of the disease.

3. A total of 42,238 admissions amongst 161,494 were assessed as presenting with a chief complaint compatible with symptomatic COVID-19 (26.2%) over the period 1st January – 13th June 2021. In comparison some 6,055 (3.7%) were assessed as exhibiting one or more diagnostic markers of SARS-COV-2 infection and 5,339 (3.3%) were found to be exhibiting a respiratory diagnosis.

4. 4,190/161,494 admissions met the criterion of a COVID-compatible chief complaint backed by a SARS-COV-2 marker diagnosis (2.6%), whereas 4,535/161,494 admissions met the criterion of a COVID-compatible chief complaint backed by a respiratory diagnosis (2.8%). The total number of admissions presenting with a relevant respiratory diagnosis and a SARS-COV-2 diagnostic marker was 125 (0.08**%).**

5. A crosstabulation of COVID-compatible symptomatic admission against declared COVID status revealed some 90.3% of all admissions tagged with the emergency department identifier '*Disease caused by 2019 novel coronavirus*' were devoid of supporting diagnoses. It is assumed these were either asymptomatic cases requiring the department for non-COVID reasons or the result of false positive tests flagging non-COVID admissions as COVID-19.

6. By adopting an audit criterion of a relevant chief complaint with a supporting respiratory diagnosis as the basis for COVID-19 validation we discover only 9.7% (204/2,102) of declared COVID cases actually exhibited the fundamental basis for symptomatic disease between 1st January and 13th June 2021.

7. It was concluded that that the ED electronic patient record system is awash with asymptomatic/false positive admissions that primarily require emergency care for non-COVID diseases and conditions whilst their data record is flagged as 'COVID'. This dilution of the true clinical picture explains the peculiar 'non-results' from various analyses undertaken and seriously undermines any and all study of the evidence base.

7 Declaration of Interests

The author declares that they have no competing interests. This study has been entirely self-funded and self-directed and is presented as the author's own original work. John Dee is a pen name owing to the sensitivities involved but my CV, biography and published papers can be made available to any *bone fide* interested party.

8 Appendix – SysFile Information

Variable Information				
Variable	Position	Label	Measurement Level	Missing Values
Date	2	Arrival date	Scale	
Targetpopulation	7	Target Population	Nominal	9
period	8	Analysis period	Nominal	
Age	9	Age	Scale	
Ageband7	16	Age band	Nominal	
Status	23	Vaccination status	Nominal	
Dose	24	Vaccination dose	Nominal	
Timing	25	Event sequence	Nominal	
When	26	Event sequence	Nominal	
VaxStatus	27	Vaccination status at admission	Nominal	
Discharge	36	Discharge Destination	Nominal	1
Discharge6	37	Destination	Nominal	
Discharge4	38	Destination	Nominal	
Discharge3	39	Destination	Nominal	
Discharge2	40	Destination	Nominal	
Complaint	41	Chief Complaint	Nominal	141
Dx_COVID	42	COVID-19 Dx	Nominal	
Dx_COMP	43	SARS-COV-2 marker Dx	Nominal	
Dx_RESP	44	Respiratory Dx	Nominal	
Dx_NCRESP	45	Non-COVID respiratory Dx	Nominal	
Dx_AMI	46	AMI/arrhythmia	Nominal	
Dx_Peri	47	Pericarditis/Myocarditis	Nominal	
Dx_DVthromb	48	Deep Vein Thrombosis	Nominal	
Dx_IChem	49	Cranial hemorhrage	Nominal	
Dx_PulEmb	50	Pulmonary Embolism	Nominal	
Dx_ITP	51	Thrombocytopenia	Nominal	
Dx_DIC	52	Coagulation disorder	Nominal	
Dx_ITPDIC	53	ITP/DIC	Nominal	
Dx_Blood	54	Clotting/haemorrhage	Nominal	
Dx_Complications	55	SARS-COV_2 complications	Nominal	
Dx_GEN	56	Chronic health indicator	Nominal	
Dx_Chronic	57	Chronic diseases	Nominal	
Dx_Flu	58	Influenza	Nominal	
Dx_Hyper	61	Hypertension	Nominal	
Dx_Diabetes	62	Diabetes	Nominal	
FAC1_1	69	Factor1: Volume	Scale	
FAC2_1	70	Factor2: Severity	Scale	
FAC3_1	71	Factor3: General bed use	Scale	
COVcomp	91	COVID compatible complaint	Nominal	
SympCOV	92	Symptomatic COVID	Nominal	
COVstatus	93	COVID designation status	Nominal	

Variable Values					
Value		Label	Value		Label
Targetpopulation	0	<18 years	Discharge6	1	Mortuary
	1	18+ years		2	ICU/HDU
	9	Unknown		3	Ward
Ageband7	1	<30 years		4	CCU
	2	30 - 39 years		5	Other
	3	40 - 49 years		6	Home
	4	50 - 59 years	Discharge4	1	Mortuary
	5	60 - 69 years		2	ICU/HDU
	6	70 - 79 years		3	Ward/Other
	7	80+ years		4	Home
Status	0	Unvaccinated	Discharge3	1	ICU/HDU
	1	Vaccinated		2	Ward/Other
Dose	0	Unvaccinated		3	Home
	1	Dose 1 only	Discharge2	1	Hospitalised
	2	Dose 2		2	Discharged
Timing	0	Not vaccinated	Dx_COVID	0	No
	1	Admitted prior to dose 1		1	Yes
	2	Admitted after dose 1 only	Dx_COMP	0	No
	3	Admitted between doses		1	Yes
	4	Admitted after dose 2	Dx_RESP	0	No
When	0	Not vaccinated		1	Yes
	1	Admitted prior to dose 1	Dx_NCRESP	0	No
	2	Admitted after 1st dose		1	Yes
	3	Admitted after dose 2	Dx_AMI	0	No
VaxStatus	0	Unvaccinated		1	Yes
	1	Vaccinated	Dx_Peri	0	Absent
Discharge	1	Unknown		1	Present
	2	A&E discharge to CCU	Dx_DVthromb	0	No
	3	A&E discharge to ICU		1	Yes
	4	Admission to the mortuary	Dx_IChem	0	No
	5	Discharge home		1	Yes
	6	Discharge to hospital at home service	Dx_PulEmb	0	No
	7	Discharge to nursing home		1	Yes
	8	Discharge to police custody	Dx_ITP	0	Absent
	9	Discharge to residential home		1	Present
	10	Discharge to ward	Dx_DIC	0	No
	11	ED discharge to ambulatory ECS		1	Yes
	12	ED discharge to ED short stay ward	Dx_Complications	0	Absent
	13	ED discharge to HDU		1	Present
	14	ED discharge to neonatal ICU	Dx_GEN	0	Good
	15	ED discharge to SCBU		1	Poor
	16	Patient discharge to legal custody	Dx_Chronic	0	No
	17	Patient transfer to other facility		1	Yes
COVcomp	0	No	Dx_Flu	0	No
	1	Yes		1	Yes
SympCOV	0	No	Dx_Hyper	0	Absent
	1	Yes		1	Present
COVstatus	0	Not COVID	Dx_Diabetes	0	Absent
	1	Test result only		1	Present
	2	Test with Dx		2	Dose 2