

## SARS-CoV-2 Testing and Patient Waiting Times in the Emergency Department

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### Abstract

#### Aim

Emergency Departments (EDs) were impacted early in the coronavirus disease 2019 (COVID-19) pandemic, with high attendance numbers. EDs relied upon SARS-CoV-2 reverse-transcriptase polymerase chain reaction (RT-PCR) tests to triage patients and facilitate admission to appropriate wards, meaning positive patients were isolated as early as possible. In October 2020, we introduced a 24-hour SARS-CoV-2 testing service. We examined the impact of this on patient experience times (PETs) in the ED, and on healthcare-associated (HA) COVID-19 infections.

#### Methods

Data on PETs before and after the introduction of 24-hour testing were available from the ED. HA COVID-19 infections were reported weekly to the Health Services Executive as a key performance indicator.

#### Results

Mean PET prior to the pandemic was 20 hours and dropped to 10 and 13 hours respectively in the first and second wave. A surge in case numbers and ED attendances during the third wave was not reflected in a rise in PETs, with a mean PET of 11 hours, significantly below pre-pandemic levels. HA-COVID-19 infections remained stable between wave one and three (83 v 92).

#### Conclusion

The introduction of 24-hour SARS-CoV-2 testing in our ED contributed to a reduction in PETs, facilitated appropriate patient placement at ward level, and kept HA-COVID-19 infections at acceptably low levels.

**Keywords:** SARS-CoV-2; Emergency Department; Patient waiting times; Healthcare-associated COVID-19

## Introduction

COVID-19 became a global pandemic in early 2020, and emergency departments (EDs) were impacted early on, needing to differentiate coronavirus disease 2019 (COVID-19) from other seasonal respiratory viruses with similar clinical presentations. To prevent nosocomial transmission of COVID-19, many EDs introduced a clinical assessment tool, combined with SARS-CoV-2 reverse-transcriptase polymerase chain reaction (RT-PCR) diagnostic tests to triage patients in the ED, and to facilitate admission to appropriate wards.<sup>1</sup> Clinical assessment tools relied on clinical history and findings, laboratory results, and radiology to categorise patients according to clinical likelihood of COVID-19.<sup>1</sup> In this way, positive patients were separated from negative patients as early as possible, and isolation rooms in the EDs and on wards were prioritised for patients likely or confirmed to have COVID-19 infection.

Ireland's Emergency Departments are challenged by limited capacity, high presentations, and prolonged waiting times, with ED presentations increasing year on year.<sup>2</sup> Patient Experience Times (PET) are an important metric monitored by health services, quantifying the length of time patients wait in ED before they are either discharged or admitted to hospital.<sup>3</sup> These times are tracked against national targets, with an aim that 95% of patients should be either admitted or discharged within six hours of arriving at an ED, and 100% of patients should be admitted or discharged within 9 hours of presentation. However, national performance data from 2018 suggests this target was only achieved for approximately 60% of all patients, and for less than 30% of those requiring admission to a ward bed.<sup>4</sup> The COVID-19 pandemic posed additional challenges to EDs, requiring early identification of patients with COVID-19, segregation of those from patients not infected with COVID-19, and prompt admission of patients to appropriate wards.

At the beginning of the pandemic, pathways were introduced in our ED, with patients with clinical symptoms of COVID-19 on a COVID pathway, and those without symptoms on a non-COVID pathway. The ED expanded to incorporate a co-located 12 bed ward which was used for non-COVID pathway, and ED medical staff increased by ~20%. After emergency treatment patients were then admitted to a dedicated single room on a COVID-19 ward, or a room of any occupancy number on a non-COVID ward, respectively, based on this pathway, or if SARS-CoV-2 test results were available. A SARS-CoV-2 molecular RT-PCR diagnostic service was introduced in our laboratory in March 2020. During the early stage of the pandemic, a global shortage of molecular kits and reagents led to turnaround times (TAT) in excess of 24 hours for results. With the expansion of tests and reagents, and in anticipation of a winter surge of COVID-19 infections, we introduced a laboratory based 24-hour SARS-CoV-2 testing service in October 2020. We examined the impact of the introduction of 24 hour testing for SARS-CoV-2 on PETs in the ED, and also on healthcare-associated (HA) COVID-19 infections in our institution.

## Methods

The Mater Misericordiae University Hospital is a 600-bed hospital in Dublin, Ireland, with >35% single occupancy rooms. Two COVID-19 wards are dedicated to accommodating admitted patients undergoing assessment for COVID-19, with a maximum of 52 single en-suite rooms for this purpose, 13 of which are positive pressure ventilated lobby (PPVL) rooms. The hospital serves a population of 185,000 people in north Dublin, with over 83,000 ED attendances per year. As part of COVID-19 preparations, 15 “open cubicles” were converted to sealed bays for patients suspected of COVID-19 infection. The ED has one negative pressure isolation room. The ED resuscitation room has five high acuity bays which cannot deliver respiratory isolation.

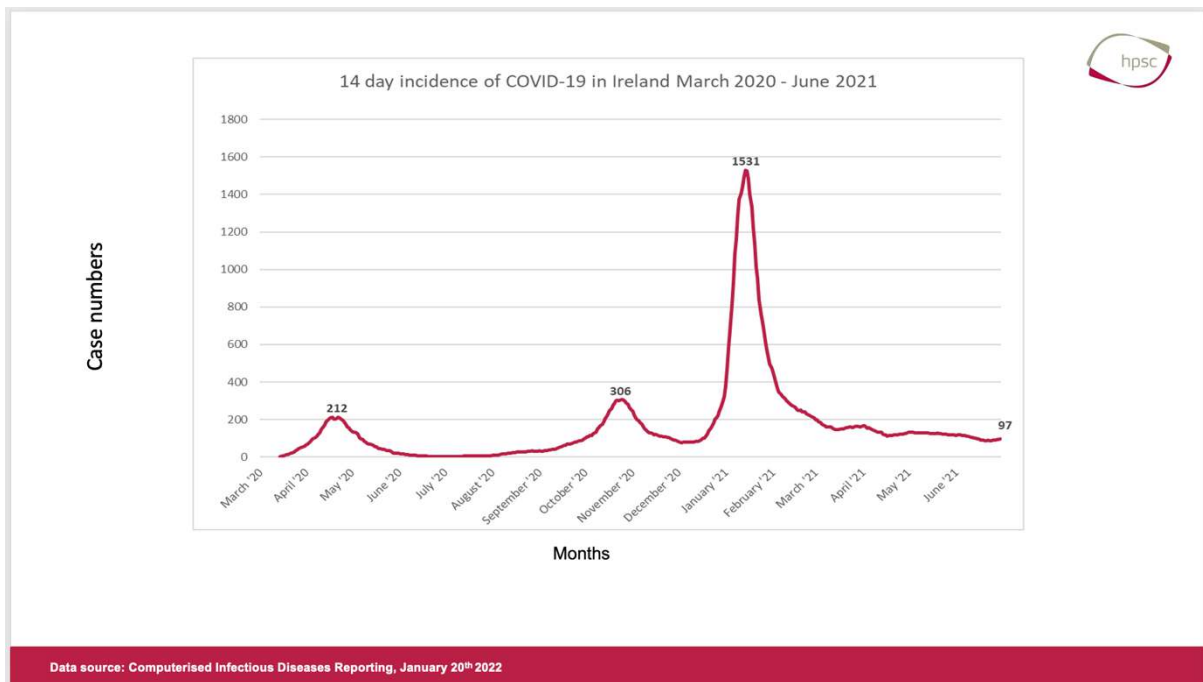
Molecular testing for SARS-CoV-2 was introduced in the microbiology laboratory in March 2020, using the Roche Flowflex RT-PCR assay. A global shortage in supply of kits and reagents led to expansion of testing platforms to include Cepheid GeneXpert, and Alinity M. From March until October 2020, a molecular testing service for the ED was available from 8 am until 11pm daily. Results on patients seen in the ED after 11pm were available on the next morning. In October 2020, we introduced a 24-hour SARS-CoV-2 RT-PCR testing program for the ED. This included a four-hourly testing service, 6 times in 24 hours for the ED. ED staff delivered samples to the laboratory at pre-arranged four-hourly drop-off times, and results were reported at the end of each test run. A rapid testing service for these samples with GeneXpert at 9pm, 1am and 5am provided results for all patients seen in the ED after 11pm and facilitated placement of patients on appropriate wards. From 8am until 4pm, tests were done on Roche Flowflex, or on Alinity M. Laboratory turnaround time (TAT) was defined as the time interval between specimens being received in the laboratory and results being available on the hospital information system. Data on PETs before and after the introduction of 24-hour testing was available from the ED. HA COVID-19 infections were reported weekly to the Health Services Executive as a key performance indicator and we compared this data before and after introduction of 24-hour testing.

## Results

During the study period, Ireland experienced three waves of COVID-19, the initial wave beginning in February 2020, the second wave in August 2020, and the most severe third wave from November 2020, until May 2021 [Figure 1].<sup>5</sup> PETs in our ED varied during each of these waves of COVID-19 [Figure 2]. In the two weeks immediately prior to Ireland’s first nationwide lockdown being implemented (1<sup>st</sup> March to 11<sup>th</sup> March 2020), the mean PET was 20 hours [13-20]. After national stay-at-home orders were put in place, the mean PET dropped to 10 hours [4-22] for the remainder of the first wave (12<sup>th</sup> March to 31<sup>st</sup> July), reflecting low ED attendances during that period. (Table 1). The mean laboratory TAT for this period was 770 minutes [513-1061], while the mean number of specimens processed for SARS-CoV-2 testing per month was 653.8 [352-910].

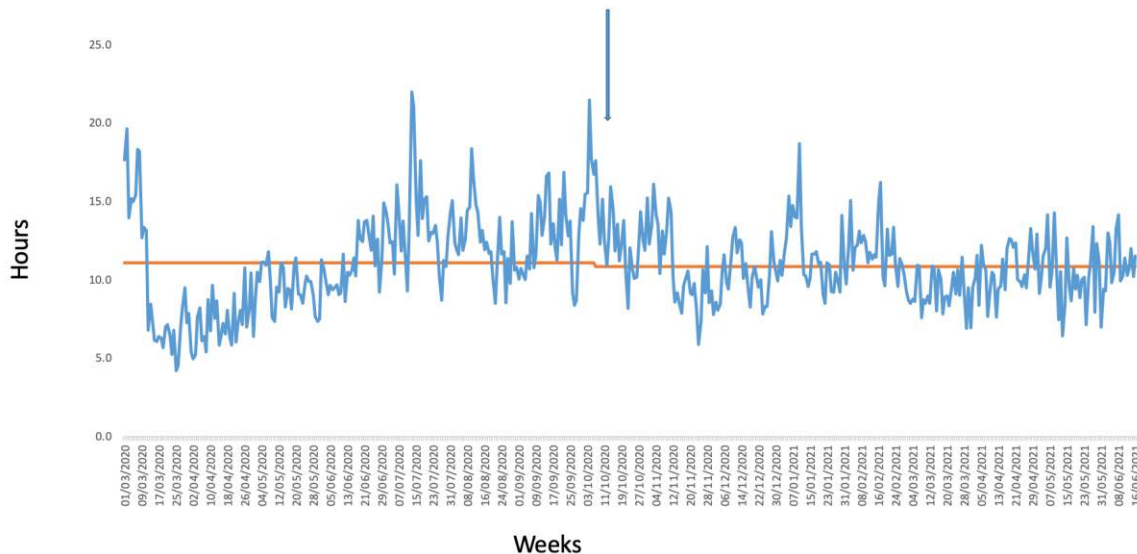
Dates		ED Attendances [per day]	Healthcare Associated Infections [per week]
<b>Wave 1</b> 1/3/20 – 31/7/20 (152 days)	Mean	126	4.15
	Median	126	2
	Range	[63-186]	[0-11]
	<b>Total</b>	<b>19,332</b>	<b>83</b>
<b>Wave 2</b> 1/8/20 – 21/11/20 (111 days)	Mean	135	0.94
	Median	138	0
	Range	[95-175]	[0-8]
	<b>Total</b>	<b>15,235</b>	<b>15</b>
<b>Wave 3</b> 22/11/20 – 31/5/21 (190 days)	Mean	137	3.07
	Median	135	1
	Range	[82-197]	[0-25]
	<b>Total</b>	<b>28,258</b>	<b>92</b>
<b>3 Waves</b> 1/3/20 – 31/5/21 (456 days)	<b>Total</b>	<b>62,825</b>	<b>190</b>

**Table 1:** Emergency Department attendances and healthcare associated infections during waves one to three of COVID-19.



**Figure 1:** 14 day cumulative incidence rates per 100,000 population of confirmed cases of COVID-19 by notification date in Ireland from 02/03/2020 until 30/06/2021.

*Note: Computerised Infectious Diseases Reporting (CIDR) is a dynamic system and case details may be updated at any time. Therefore, the data described here may differ from previously reported data and data reported for the same time period in the future. Due to the Health Services Executive (HSE) cyber-attack, data reported during the time period 14/05/21 – 30/06/21 was based on COVID Care Tracker data, not CIDR data and therefore may differ from data reported on this graph.*



**Figure 2:** Patient Experience Times (PETs) before and after the introduction of 24-hour SARS-CoV-2 testing, indicated by arrow.

A smaller second wave, from 1<sup>st</sup> August 2020 until 21<sup>st</sup> November 2020, resulted in a series of regional restrictions. ED attendances rose during this period, reflected in a rise in mean PET for the second wave to 13 hours [8-21]. The introduction of 24-hour SARS-CoV-2 testing in October 2020 resulted in a drop in PET to 12 hours [8-18] for the remainder of the second wave. Mean laboratory TAT for this wave also reduced to 222.3 minutes [194-242], despite a surge in the mean number of SARS-Co-V-2 test specimens processed per month, at 1032.3 [778-1421].

A surge in case numbers and ED attendances during the third wave of COVID-19 in Ireland, from November 2020 to May 2021, was not reflected in a rise in PETs, with a mean PET of 11 hours [6-19], significantly below pre-pandemic levels. Laboratory activity again increased, with a mean of 1616.4 SARS-Co-V-2 test specimens processed per month [1401-1741], while mean laboratory TAT remained low at 204.4 minutes [173-244]. We reported 83 HA COVID-19 infections in the first wave, 15 in the second wave, and 92 in the third wave (Table 1).

## Discussion

In the early stages of the COVID-19 pandemic, EDs saw a significant fall in presentations, with reduced population movement, combined with patients' perceived risk of acquiring COVID-19 in the ED setting, and the adoption of 'cocooning' behaviour amongst high-risk patients.<sup>6</sup> The low ED attendances and corresponding low PETs in our institution was expected, reflecting international findings showing a tendency towards ED avoidance among patients during this period.<sup>7</sup> The significant third 'Delta' wave of COVID-19 in Ireland caused a surge in both SARS-Co-V-2 case numbers, and ED presentations. However, this did not result in increased PETs in our institution, rather a reduction to levels far below pre-pandemic waiting times.

A study in Johns Hopkins evaluated targeted rapid testing for SARS-CoV-2 in the ED in 2020, and found that rapid testing was associated with a 12.6 h reduction in median exposure time of uninfected patients, to infected patients.<sup>8</sup> Also, this intervention was associated with decreased infection control resource consumption and healthcare expenditures, and translated to cost-savings of over US\$650,000 in non-reusable PPE alone. Moreover, 90% of rapid results were available during the ED encounter, enabling optimal inpatient cohort assignment.

The numbers of HA COVID-19 infections in our institution remained at a sustained low level during a 6-month challenging third wave, and after the introduction of 24-hour testing. It is likely that with frequent overnight testing runs, fewer patients with COVID-19 were inadvertently placed in open non-COVID-19 wards, and thus reduced the potential for HA COVID-19 infections to occur. While data was not recorded on the number of patients admitted to a multi-bed room from the non-COVID pathway before a positive result of SARS-CoV-2 detected was returned, the experience of the outbreak control team is that the main source of outbreak in the hospital after introduction of 24-hour testing was patients who were incubating virus from the community, and had negative admission screens followed by a positive test at or before day five of admission. Early identification of COVID-19 status of patients also reduced admitted patient movements from a multi-occupancy ward bed to a COVID-19 isolation bed, thus improving bed access for new ED hospital admissions. We found minimal issues with access block in our ED during the study period, with patients generally able to move to the ward when results were available, assisted by designated COVID-19 pathway beds which were kept free for positive patients. A study in Dublin during a period of low incidence of SARS-CoV-2 looked at universal testing of ED admissions to prevent onward transmission.<sup>9</sup> While the study identified few detections on a non-COVID-19 pathway, the value lay in preventing transmission, early implementation of IPC measures, and identification and minimisation of close contacts at ward level. Timely diagnostics to differentiate other viral respiratory infections, such as influenza in the ED, have shown similar benefits to our study, as point-of-care testing for influenza demonstrated improved patient flow in the ED, and reduced healthcare associated infections.<sup>10</sup>

Limitations of this study include a single centre setting, with a large volume testing capacity and resources, which may not be available for wider application. Also, the true clinical sensitivity of all diagnostic tests for SARS-CoV-2 is unknown, and this study may include patients with false-negative results, and likely incubating the virus from the community, resulting in some onwards transmission to other inpatients. Confounding factors which also may have contributed to the reduction in PETs include the expansion in physical space in the ED, with the acquisition of extra beds and construction of a new temporary triage area, and the recruitment and redeployment of additional medical and nursing staff to the ED. The introduction of the Frailty Assessment Team in autumn 2020, which assessed frail older adults in the ED, aiming to avoid admission and get these patients directly home with community care plans also certainly contributed to improved efficiency in the ED, and complemented the testing strategy.

In summary, the introduction of 24-hour SARS-CoV-2 testing in our ED contributed to a reduction in PETs, facilitated segregation of patients in the ED, and appropriate patient placement at ward level. Despite a long and challenging third wave of COVID-19, it has positively impacted on our hospital's ability to keep HA COVID-19 infections at a low level.

**Declaration of Conflicts of Interest:**

None declared.

**Ethical Approval:**

This study was approved by the Research Ethics committee, Mater Hospital, Dublin, Ireland.

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