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The Effect of COVID-19 Social Restrictions on Major Trauma Volumes and Resource Utilisation at a Level 1 Trauma Centre

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The Coronavirus (COVID-19) pandemic has posed a significant challenge for the Australian population, economy and healthcare. In stages from 23/03/2020 the Australian government placed social restrictions, mandatory self-isolation laws and quarantining all overseas travellers. The healthcare response involved re-allocation of resources, increasing intensive care capabilities, staff re-training and cancellation of elective surgery. The local effect of the pandemic on trauma epidemiology is unknown. It has been even speculated that major trauma would disappear and trauma specialist staff could be redirected to the pandemic response. Certain injury mechanisms (self-harm, domestic violence) were expected to increase[1]. The purpose of this study was to provide objective data on changes in major trauma volumes to aid future planning. We hypothesised that trauma volumes and associated resource utilisation will decrease.

In this observational study a prospective "COVID-cohort" (March-May 2020) was compared to retrospective control period (March-May 2011-2019). All trauma resuscitation patients' data from the John Hunter Hospital, required by the New South Wales trauma registry, was utilised. Details regarding statistical analysis is provided in the Supporting Information. This study was granted a waiver from the institutional Ethics Committee.

A total of 3574 patients were included (COVID: 259, Control: 3315). There were no differences in age, sex and injury severity score (ISS). See Table 1. Mechanism of injury also remained unchanged (Table 2). During the COVID period there was decrease in admissions (368±73 to 259; p=<0.002), severely injured patients (ISS>12) (124±16 to 96; <0.001), intensive care unit(ICU) admissions (56±10 to 35; p=<0.001), ventilator requirements (35±9.3 to 23; p=0.006), operative cases (142±30 to 106; p=<0.001) and in inpatient mortality (3.1%±1.2% to 1.5%; p=0.004). See Table 1. The strictest restrictions were in April and the number of severely injured patients, ventilator requirements and inpatient mortality remained unchanged to the control cohort during this period (Supporting Information).

For patients self-presenting to hospital, it is possible that the fear of contracting COVID-19 in the healthcare setting could be a potential barrier however the catchment area for our level-1 trauma centre was not severely affected by COVID-19 cases (total of 279 cases in 3 months from a population of a million with 6 ICU admissions and 4 deaths). Therefore, we can assume that reductions in admissions have largely been due to social restrictions enforced by the government[2].

Our study shows no significant changes in mechanism of injury. Two similar studies however have shown a significant decrease in traffic, industrial, sports and fall related trauma during periods of social restrictions[3,4].

The limitation of this study is the single-centre nature and it did not cover potential second waves. A strength is that our hospital is the only level-1 trauma centre in the area and receives the majority of trauma patients. We extended the study period to ten years to include a larger control cohort and covered the adjacent months for government restrictions not addressed by previous studies [3,4].

Despite a reduction in admissions, the demand for trauma care is still consistent with the requirements of a fully functioning trauma service, which should be taken into account by clinicians and hospital administrators when making resource allocation and utilisation decisions[5]. Severely injured patients require comprehensive early management and the importance of senior experienced trauma clinicians being available for decision making cannot be undervalued[6,7]. Task

shifting of trauma specialist services to viral pandemic management is unlikely to be warranted based on the first wave of COVID-19 in our trauma system[8].

Figure 1 (Supporting Information) depicts total number of admissions per week extending beyond the period of analysis. As social restrictions continue to ease throughout New South Wales it appears that the number of admissions is beginning to increase. In light of this a future longitudinal observational study may be of benefit to monitor future trends as restrictions continue to ease.

References:

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Table 1. Demographics; Primary and Secondary Outcomes

	Pre-COVID (2011-19) (n=3,315)	COVID (2020) (n=259)	p value
Age (year; mean, SD)[a]	38 (±21)	40 (±23)	0.13
Sex (male; n, %)[b]	2,432 (73%)	183 (71%)	0.34
Injury type (blunt; n, %)[b]	3,041 (94%)	238 (94%)	0.76
ISS (median, IQR)[c]	9 (4-16)	8 (4-16)	0.21
Admissions/year (patients; mean, SD)[d]	368 (±73)	259	0.002
ISS >12/year (patients; mean, SD)[d]	124 (±16)	96	<0.001
Operative patients/year (patients; mean, SD)[d]	142 (±30)	106	<0.001
ICU admissions/year (patients; mean, SD)[d]	56 (±10)	35	<0.001
Ventilator requirements/year (patients; mean, SD)[d]	35 (±9.3)	23	0.006
Inpatient mortality rate/year (% dead; mean,SD)[d]	3.1% (±1.2%)	1.5%	0.004
Ventilator use (days; median, IQR)[c]	3 (2-5)	3 (2-6)	0.93
ICU LOS (days; median, IQR)[c]	3 (2-5)	3 (2-8)	0.97
Acute hospital LOS (days; median, IQR) [c]	3 (1-6)	3 (1-7)	0.44

SD indicates standard deviation; IQR interquartile range; ISS injury severity score; ICU intensive care unit; LOS length of stay
a-independent t-test; b- Chi^2 test; c-Mann Whitney U test; d-one-sample t-test;

Table 2. Mechanism of Injury Breakdown – Month by Month

	Mechanism of Injury	Pre-COVID (2011-2019) (n=3,315)	COVID (2020) (n=259)	p value
March (patients; n, %)[a]	Traffic	409 (35%)	34 (43%)	0.62
	Recreational	383 (33%)	26 (33%)	
	Fall	211 (18%)	10 (13%)	
	Self-Harm and Assault	118 (10%)	7 (8.8%)	
	Other	48 (4.1%)	3 (3.8%)	
April (patients; n, %) [a]	Traffic	323 (32%)	32 (35%)	0.87
	Recreational	343 (33%)	32 (35%)	
	Fall	179 (17%)	16 (17%)	
	Self-Harm and Assault	116 (11%)	8 (8.7%)	
	Other	62 (6.1%)	4 (4.4%)	
May (patients; n, %) [a]	Traffic	432 (39%)	28 (32%)	0.55
	Recreational	367 (33%)	35 (40%)	
	Fall	187 (17%)	13 (15%)	
	Self-Harm and Assault	82 (7.3%)	8 (9.2%)	
	Other	53 (4.7%)	3 (3.5%)	

Traffic includes all traffic accidents occurring on public roads; recreational includes leisure activities, non-traffic related car, motorcycle, pedal cycle and animal related trauma; other includes burns and unspecified mechanisms; a- Chi^2 test

Methods:

Study Design:

This retrospective observational study utilised the prospectively collected data extracted from the John Hunter Hospital trauma registry and real-time prospective data during the pandemic. This study was reviewed by the Hunter New England Human Research Ethics Committee and did not require ethics approval (authorisation number: AU202004-17).

Sample:

We studied all trauma-related admissions for the period of March-May from 2011 to 2020 at the John Hunter Hospital. The John Hunter Hospital is a state designated, Royal Australasian College of Surgeons verified Level-1 trauma centre and is the only major tertiary referral hospital for the Hunter New England and Mid North Coast area. The John Hunter Hospital is also the designated COVID-19 hospital within the Hunter New England area. Our catchment area for major trauma is approximately 141,000 square kilometres and has a mixed rural and metropolitan population of approximately 1.1 million people.

Data Source/Study Participants:

Data were extracted from the New South Wales Trauma Registry and included date of hospital admission, basic demographics, mechanism of injury, Injury Severity Score (ISS), operative procedures, intensive care length of stay (ICU LOS), ventilator requirements, hospital length of stay (LOS) and in-hospital mortality. Patients with isolated head injuries from low energy mechanisms (i.e. falls <1m) were excluded.

The “COVID-19 cohort” consisted of patients admitted to John Hunter Hospital in the three month period between March 1 2020 and May 31 2020. The “control cohort” consisted of patients admitted to John Hunter Hospital during the same period in the previous 9 years. The COVID-19 cohort was further stratified as “March” (from no restrictions to restrictions), “April” (complete month with same restrictions) and “May” (from restrictions to less restrictions”)

Primary outcomes consisted of differences between the COVID-19 cohort and the control cohort in hospital admissions.

Secondary outcomes consisted of differences in number of operative cases, intensive care admissions, ventilator requirements, ISS and inpatient mortality.

Statistical Analysis:

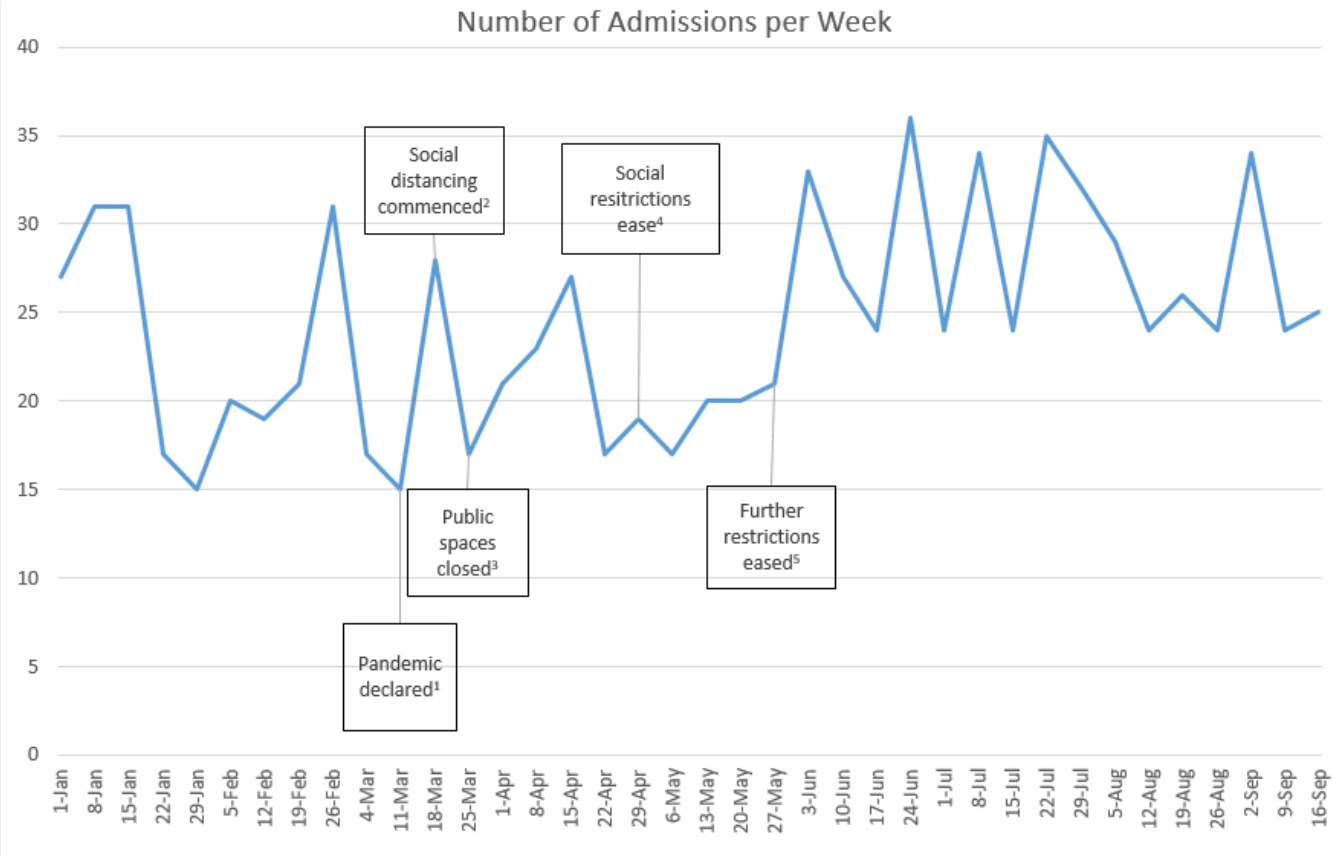
Continuous data were assessed for distribution and presented as mean and standard deviation, or median and interquartile ranges. Categorical data are presented as a count and percentage. For normally distributed continuous data independent t tests were used to compare the entire pre-COVID cohort with the COVID cohort for age. One sample t-tests were used for comparing the singular values of the COVID period with the annual values during the pre-COVID period of admissions, ISS>12 patients, operation patients, ICU admissions, ventilated patients and inpatient mortality rate. A Mann-Whitney U test was employed for non-normal distributions of ISS, ventilator days, ICU length of stay and acute length of stay between the pre-COVID cohort and the COVID cohort. A Chi-square test was used for categorical values. These were sex, blunt injury and the mechanism of injury. Alpha value was set at 0.05. Statistical analyses were programmed using Stata v13.0 (StataCorp LP, College Station, TX, USA).

Supporting Table 1. Primary and Secondary Outcomes – Month by Month

	March/April/May	Control (2011-2019) (n=3,315)	COVID (2020) (n=259)	P value
Admissions/month (patients; mean, SD)[a]	March	130 (±27)	80	0.001
	April	114 (±28)	92	0.044
	May	125 (±25)	87	0.002
Operative patients/month (patients; mean, SD) [a]	March	47 (±12)	33	0.009
	April	44 (±9.8)	39	0.18
	May	46 (±8.4)	30	<0.001
ICU Admissions/month (patients; mean, SD) [a]	March	19 (±4.7)	14	0.014
	April	19 (±6.5)	10	0.005
	May	18 (±5.2)	11	0.003
Ventilator requirements/month (patients; mean, SD) [a]	March	13 (±5.6)	9	0.049
	April	11 (±6)	9	0.3
	May	10 (±4.4)	5	0.008
Inpatients deaths/month (patients; mean, SD) [a]	March	4.1 (±2.3)	0	0.001
	April	3.7 (±2.6)	3	0.46
	May	3.3 (±1.1)	1	<0.001
ISS >12 admissions/month (patients; mean, SD) [a]	March	83 (±16)	56	0.001
	April	80 (±19)	65	0.05
	May	80 (±16)	61	0.01

SD indicates standard deviation; ICU, intensive care unit; ISS, injury severity score; a-one-sample t-test

Supporting Figure 1. Weekly Admissions January 2020 to September 2020



1. Pandemic declared by World Health Organisation on 12th March 2020
2. Stage 1 lockdown officially enforced by the Australian Government on 23rd March 2020
3. Public spaces such as restaurants, bars, beaches, parks etc close on 28th March 2020
4. Restrictions on visiting other households eased on 1st May 2020
5. Venues begin to re-open with 1 person per 4 square metre rule, 20 guests allowed inside and outside the home on 1st June 2020