

Maintaining elective surgery capacity while freeing up resuscitation capacity: the challenge of COVID-19 epidemic resumption

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Dear Editor

The Covid-19 pandemic is challenging healthcare systems worldwide, especially ICU capacity. Availability in the ICU can be increased by postponing elective surgery to limit the need for downstream ICU beds or by temporarily increasing the capacity by using perioperative anaesthesia resources. During the initial French lockdown, all elective operations were postponed, and ICU capacity was temporarily doubled by transforming beds from acute care units or postoperative anaesthetic units¹. The ongoing postponement of non-essential surgeries worldwide to promote non-surgical care is unprecedented². It has been estimated that 28.4 million operations were cancelled globally in the spring of 2020, of which 90.2 per cent were for benign diagnoses or conditions³. Final arbitration between maintenance or postponement was based on evaluation by expert committees, guidelines from learned societies, pressure on ICU resources, and individual benefit *versus* risk analysis^{4,5}. The pandemic has become a long-term crisis that requires frugal surgical strategies with significant impact on ICU capacity. The authors' objective was to describe the direct impact of routine elective surgery on ICU capacity in adults in France.

All hospital stays of adults (aged 18 years or above) in France in 2018, recorded in the exhaustive national hospital PMSI database (accessed on ATIH platform), were analysed to describe ICU occupancy, focusing on surgical activity. Hospital surgical stays without entry by emergency wards were considered as a proxy of 'elective' surgery. The diagnosis-related groups (DRGs) involving the greatest number of days in the ICU for elective surgery were described by type of hospital.

In 2018, 239 930 adults stayed in an ICU for a total of 1 627 404 days, occupying an equivalent of 4459 beds (88 per cent of the 5050 overall French adult ICU capacity). Of these days in an ICU, 742 138 (45.6 per cent) were associated with surgical care. Among those, 508 745 (68.6 per cent) related to elective surgery,

occupying 1394 resuscitation beds (31.3 per cent of all 4459 ICU beds), located mainly in public university hospitals (62.0 per cent) or private hospitals (17.9 per cent).

Overall there were 5.5 million surgical hospital admissions in adults (2.8 million outpatient stays and 2.7 million inpatient stays). Only 3.5 per cent of the 2.2 million elective inpatient surgical stays (EISSs) led to any time spent in the ICU, for a mean length of stay (LOS) of 6.60 days (0.22 days in ICU per EISS overall). The top 20 DRGs associated with highest ICU occupancy for elective surgery represented only 211 903 stays (9.6 per cent of EISSs) for 1066 ICU beds (76.5 per cent of the elective surgery ICU occupancy) (Table 1). These DRGs were mainly life-saving interventions (oncology, major cardiac or neurosurgery), and represented approximately 80 per cent of ICU occupancy in university and private hospitals, 55 per cent in non-university public hospitals, and 70 per cent in non-profit private hospitals. In these DRGs, 27.6 per cent of stays involved the ICU for a mean LOS of 3.3–26.2 days.

ICU occupancy was concentrated on a few major surgical procedures in expert centres. The majority of elective surgery interventions have no direct impact on ICU occupancy. Expert centres usually perform all types of operations, from simple inpatient to major expert surgery. In expert centres, reconciling ICU need due to both COVID-19 and major surgery would require increasing the ICU capacity by temporarily reassigning staff and material from operating theatres at the expense of minor elective surgery. Extending the surgical capacity of non-expert centres would allow the unperformed activity of expert centres to be accommodated. Such adaptation could be made in a dynamic way.

Favouring an adaptation of surgical organization at the regional level rather than a hospital-based decision for postponement would optimize surgical and ICU capacity, and provide equality for patients regardless of the centre in which they are to have surgery.

Table 1 Top 20 most frequent diagnosis-related groups in ICUs for non-emergency ward admission inpatient surgical stays (proxy for elective surgery) according to hospital type

	Stays		Mean LOS in ICU (days)	No. of ICU beds [†]					
	n	% of stays with ICU		Overall		Public hospitals		Private hospitals	
			n	% of beds	University	Non- university	Non-profit	Profit	
Valve replacement surgery with ECC	14 203	90.7	4.3	151.4	10.9	90.5 ^{#2}	3.0	12.6 ^{#1}	45.3 ^{#1}
Craniotomy not related to trauma	19 234	21.0	11.6	127.6	9.2	100.3 ^{#1}	11.8 ^{#2}	9.4 ^{#3}	6.1 ^{#10}
Aortocoronary bypass without cardiac catheterization nor coronarography	11 421	86.9	3.3	89.4	6.4	47.6 ^{#4}	2.4	8.5 ^{#5}	31.0 ^{#2}
Major intervention on small intestine and colon	50 171	7.2	8.9	87.4	6.3	39.2 ^{#6}	24.5 ^{#1}	6.7 ^{#6}	17.1 ^{#4}
Major intervention on chest	21 883	14.9	7.8	69.6	5.0	32.0 ^{#10}	8.3 ^{#3}	10.4 ^{#2}	18.8 ^{#3}
Other cardiothoracic or vascular intervention with ECC	4801	89.6	5.7	67.2	4.8	45.7 ^{#5}	0.9	8.4 ^{#4}	11.7 ^{#7}
Intervention for multiple severe injury	2135	78.3	12.7	58.1	4.2	54.0 ^{#3}	3.2	0.3	0.6
Valve replacement with ECC and cardiac catheterization or coronary artery surgery	3215	93.2	6.7	55.0	3.9	35.5 ^{#8}	0.3	5.7 ^{#7}	13.6 ^{#5}
Major revascularization surgery	25 790	12.9	5.3	48.2	3.5	24.4	6.6 ^{#4}	4.8 ^{#9}	12.5 ^{#6}
Craniotomy for trauma	3014	35.4	13.8	40.3	2.9	35.2 ^{#9}	2.6	1.2	1.4
Transfer/short stay for other cardiothoracic or vascular procedure without ECC	3159	53.4	8.0	36.8	2.6	28.7	1.6	2.1	4.7
Liver transplantation	1017	91.4	14.3	36.4	2.6	36.4 ^{#7}	0.0	0.0	0.0
Intervention on oesophagus, stomach or duodenum for malignant tumour	4601	26.4	10.4	34.4	2.5	22.2	4.9 ^{#7}	3.5	3.8
Aortocoronary bypass with cardiac catheterization or coronarography	2913	91.4	4.7	34.2	2.5	22.8	0.3	1.5	9.5 ^{#8}
Intervention on liver, pancreas and portal vein or vena cava for malignant tumour	8868	20.7	6.5	32.7	2.3	18.0	4.0 ^{#9}	5.3 ^{#8}	5.4
Heart transplantation	325	100	26.2	23.3	1.7	21.9	0.0	1.4	0.0
Intervention on kidney and ureters, and major bladder surgery for malignant tumour	18 051	7.2	5.4	19.5	1.4	5.3	5.6 ^{#6}	4.4 ^{#10}	4.2
Burns with skin graft	1227	25.0	23.0	19.3	1.4	13.0	6.3 ^{#5}	0.0	0.0
Rectal resection	15 599	6.4	7.0	19.1	1.4	6.8	3.8 ^{#10}	2.3	6.2 ^{#9}
Lung transplantation	276	99.3	22.0	16.5	1.2	12.7	0.0	3.8	0.0
Overall 20 DRGs with highest ICU occupancy	211 903	27.6		1066.4		691.0	90.0	82.8	201.6
Overall elective surgical stays and related occupied ICU beds	2 210 284	3.5		1393.8		863.7 (62.0)	162.8 (11.7)	117.6 (8.4)	249.7 (17.9)
Proportion related to the 20 most frequent types of stay (%)	9.6			76.5		80.0	55.3	70.4	80.7

^{*} Values in parentheses are percentages. [†] The rank of diagnosis-related group (DRG) among ICUs, by hospital type (university public hospitals, other public hospitals, non-profit and profit private hospitals). LOS, length of stay; ECC, extracorporeal circulation; DRG, diagnosis-related group.

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