A retrospective review of 'code grey' emergency response calls at Cabrini Malvern (Part 2)

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INTRODUCTION

Healthcare workers, as frontline responders to stressful, unpredictable and potentially volatile clinical situations, are known to be particularly vulnerable to aggression [1]. Workplace violence, both physical and verbal, can result in potential injuries and negative mental health outcomes, including reduced work interest and functioning, depression, post-traumatic stress disorder, ethical decline and burnout in healthcare workers. It may also compromise patient safety and create further adverse events [2]. Organizational "code grey" standards have been introduced to all Victorian public health services since 2015 for effective management of aggressive or violent behaviours [3]. The "code grey" response was initiated at Cabrini Health in December 2018 for effective management of aggressive behaviours. Previous studies have mainly focused on violence in public hospitals, particularly in emergency departments (ED), intensive care units (ICU) and mental health facilities [4-9]. Gathering data from a private hospital aims to diversify data comprehensiveness around healthcare aggression.

OBJECTIVES

- To analyse patient and situational factors of 'code grey'
- To elucidate trends in terms of how codes are actioned, such as personnel present, use of pharmacological and non-pharmacological management strategies and debriefing for staff.
- To identify demographic factors of patients involved in 'code grey' calls
- To elucidate the use of medications, including antipsychotics (AP), benzodiazepines (BZ) and opioids (OP) before codes and whether they were changed post-code.
- To evaluate outcomes from code incidences and its impact on patient diagnoses and management

METHODOLOGY

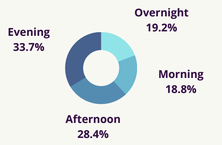
This retrospective analysis reviewed 208 'code greys' that occurred at Cabrini Hospital Malvern. Data were extracted from RiskMan™ reports in conjunction with both electronic and paper-based patient files from 4 December 2018, to 24 December 2022. This part 2 review builds on work undertaken and presented in 2022, which relied solely on electronic medical record (EMR) data, did not incorporate ancillary documented paper record notes for context and did not include 2022 code grey incidents. Paper records were reviewed to provide clinical and environmental contexts during the critical period of code activation and elucidate events that preceded and followed the code. Exclusion criteria included codes caused by healthcare staff or external members of the public, paediatric patients, instances where paper records related to the code were either inaccessible or unavailable, RiskMan™ reports lacking identifiable patient markers, and multiple RiskMan™ reports that redundantly captured the same code event from different reporters.

RESULTS

208 code grey incidents were analysed in this study that involved a total of 177 patients. 21 patients were responsible for multiple codes.

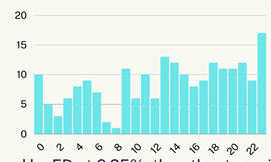
Situational Factors

- Timing of 'code grey' call was **mostly after midday** (evening 1800-2359 hours: n = 70, 33.65% of codes; afternoon 1200-1759 hours: n = 59, 28.37%; overnight 0000-0559 hours: n = 40, 19.23%; morning 0600-1159 hours: n = 39, 18.75%)



Proportion of Code Grey Calls at Different Time Periods of Day

Figure 1: Pie chart of timing of code grey calls organised into overnight (0000-0559), morning (0600-1159), afternoon (1200-1759) and evening (1800-2359)



Frequency of Code Grey Calls against Time of Day/hrs

Figure 2: Histogram showing frequency of code grey calls on hourly basis with peak at 2300

- A **high proportion of codes occurred in the wards at 87.5%**, followed by ED at 6.25%, then theatre suites at 1.44%
  - **Top wards for incidences were 3C and 3W**, accounting for 15.87% of incidents each (n = 33 respectively)
  - Other wards in decreasing order: 3S (n = 31), 1S (n = 16), 2N (n = 14), 3N (n = 10), 4S (n = 8), 1N (n = 8), 4N (n = 7), 6W (n = 6), 4C (n = 5), 2C (n = 4), 5W (n = 3), 1W (n = 2), 2S (n = 1), 4W (n = 1)
- **75.48% of codes involved physical aggression** (n = 157)
  - Self-harm = 25% (n = 52)
  - Harm to others = 67.31% (n = 140)
    - 89.29% of physical harm to others involved brute force (n = 125)
    - 18.57% involved a use of weapon (n = 26)
    - 10.71% involved bodily fluids like biting or spitting (n = 15)
  - Damage to environment = 13.94% (n = 29)
- **59.13% involved verbal aggression** (n = 123)
- **30.77% involved other forms of disruption** including wandering, absconding and intrusive behaviours (n = 64)
  - COVID-19 compliance related = 4.33% (n = 9)
  - Wandering = 12.5% (n = 26), Absconding = 12.02% (n = 25), Intrusive = 7.69% (n = 16)

Types of Aggression

Figure 3: Venn diagram demonstrating proportions of different types of aggression

Code Response

- **Personnel present at codes were most commonly nurses (97.12%, n = 202)**, followed by medical staff (50%, n = 104), security (n = 67), hospital coordinators (n = 58), visitors (n = 32), other patients (n = 12), personal care assistants/PCAs (n = 9), visitors (n =), allied health professionals (n = 7), police (n = 5), orderlies (n = 2), students (n = 2), and non-clinical staff (n = 1)
- **7.69% of patients were managed with physical restraint** during the code (n = 16)
- **57.21% were administered medications** during the code (n = 119), with **46.63% having a resultant change in medications**
- Any form of **debrief was only recorded in 24.04% of the cases**
- **Mental harm to others were recorded in 18.27% of codes**

Outcomes

- Referrals to address code-related issues were made for around 1 in 10 patients
  - **10.10% were referred to other units** (n = 21)
  - **10.58% were referred to psychiatry** (n = 22)
  - **10.58% were transferred to external services or interhospital** (n = 22)
- A **2.09x increase in 1:1 Personal Care Assistant (PCA) care requirement** was noted from 15.38% of patients (n = 32) pre- to 32.21% post-codes (n = 67)
- **Delirium diagnosis increased 1.94x** after codes from 25% pre-code (n = 52) to 48.56% post-code (n = 101)
  - Out of the 107 codes where patients were not diagnosed with delirium, 57.94% were attributed to other definite reasons/diagnoses (n = 62) like BPSD, substance use/withdrawal, or explainable discontent, whereas the other **42.06% of patients displayed behaviours suspicious of delirium, but not diagnosed as such,** including acute or fluctuating agitation, "confusion" or "disorientation" unexplained by other diagnoses and unusual to patients' baseline demeanours (n = 45)
  - Out of 101 patients with delirium diagnosis, 31.68% (n = 32) had a recent procedure within the last 28 days
- Dementia diagnosis was changed in only 1.92% of codes
- **Death within the same admission occurred in 8.47%** of the 177 patients after accounting for patients with repeat codes

Demographics & Patient Factors

- Gender of code subjects was **more likely to be male** than female (M: 134/208 = 64.42%, F: 74/208 = 35.58%)
- Age: **Mean = 76.48 years, Median = 79.5 years**
- Day of admission when 'code grey' was called: **Mean = Day 6.45, Median = Day 3**

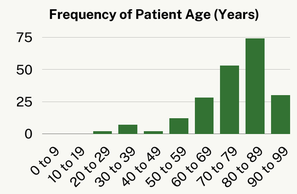


Figure 4: Age distribution of PPs demonstrate a high proportion of older patients. Mean age is 76.48 while median age is 79.5.

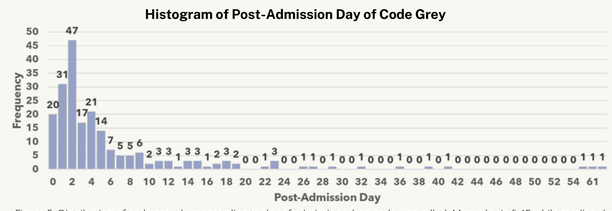
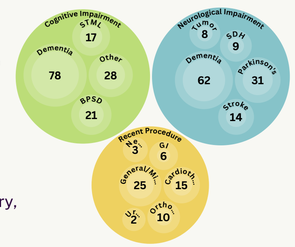


Figure 5: Distribution of code grey days according to day of admission when code was called. Mean day is 6.45 while median day is 3.

- Primary bed cards of patients were **2.72x more likely medical (56.25%) than surgical (20.67%) specialties,** on top of **17.79% who were under geriatrics**
  - Medical (n = 117) > Surgical (n = 43) > Geriatrics (n = 37) > ED (n = 10) > ICU (n = 1)
- **56.25% of patients had ongoing neurological impairment** (n = 117)
  - Within this category, **52.99% had dementia**, 26.50% had Parkinson's disease, 12.82% had residual stroke symptoms, 7.69% had SDH, 7.69% had epilepsy/seizures, 6.84% had some form of brain tumors/malignancies/metastases,
  - Rarer impairments include previous MVAs leading to brain injury, chronic migraine, meningoencephalitis, intracranial aneurysm, normal pressure hydrocephalus, post-operative acute brain syndrome, steroid-induced mania, Down syndrome, ADHD and autism
- **50% had ongoing cognitive impairment** (n = 104)
  - Within this category, **75% had dementia**, 16.35% had short term memory loss (STML), and 26.92% had other forms of cognitive impairment such as Parkinson's disease or other neurogenerative/neurocognitive conditions
  - 20.19% displayed behavioral and psychological symptoms of dementia (BPSD)
- **31.73% had previous psychiatric diagnoses**
- Medication use: **52.40% of patients were prescribed AP pre-code, 37.98% used BZ, and 37.5% used OP**
- **76.44% had recorded evidences of escalating behaviours within 24h prior to code**
- 25% had known delirium pre-code
- 29.33% had a recent procedure performed in theatre up to 28 days prior (n = 61)
  - Post-procedure day: **Mean = Day 4.16, Median = Day 2**
  - Within this subgroup, 40.98% had general/radiologically guided/minor procedures requiring local anesthetics, 24.19% had cardiothoracic surgery, 16.13% had orthopaedic surgery, 9.68% had GI surgery, 4.84% had neurosurgery and 3.23% had urological surgery
  - Out of 61 patients who had recent procedure, 52.46% (n = 32) were diagnosed with delirium

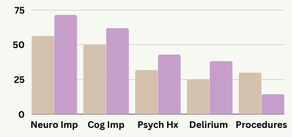


Distribution of Predisposing Factors

Figure 6: Bubble chart showing proportionate distribution of specific predisposing factors

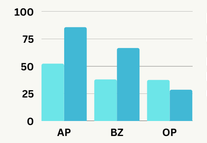
Repeat Codes

- Day of admission: **Mean = Day 7.74, Median = Day 4**
- **35.48% of subjects involved in repeat codes had PCAs present prior to code** (n = 11), up to 51.61% with 5 more requested post-code (n = 16)
- 21 patients were responsible for a total of 31 repeat codes
  - **71.43% of relevant patients had a history of neurological impairment** (n = 15)
  - **61.90% had cognitive impairment** (n = 13)
  - **42.86% had previous psychiatric history** (n = 9)
  - **85.71% were on AP** (n = 18), **66.67% were on BZ** (n = 14), **28.57% were on OP** (n = 6)
  - 38.10% had delirium pre-code (n = 8), up to 57.14% post-code (n = 12), with another 28.57% displaying behaviours suspicious of delirium
  - 14.29% had recent procedures (n = 3)



Diagnoses Prior to Code (General VS Repeat Subjects)

Figure 7: Comparison of respective diagnoses proportions between general cohort population (brown) and repeat subjects of codes (purple)



Medications Prior to Code (General VS Repeat Subjects)

Figure 8: Comparison of medication proportions between general cohort population (light blue) and repeat subjects of codes (dark blue)

DISCUSSION

Situational Factors
Understanding situational factors associated with higher incidences of aggression can facilitate better planning for allocating hospital resources, like staffing ratios or security availability around peak times. For instance, our study found that most code greys occurred on the ward (87.5%), with ED at 6.25% and theatre suites at 1.44%. The top wards for reported codes were 3C and 3W, accounting for 15.87% of incidents each. Surprisingly low proportion of codes found in the emergency department and surgical environments may indicate selection bias or that post-operative codes more frequently occur on the wards. Furthermore, the lower proportion of surgical patients contributing to Code Grey calls in this study might also be influenced by smaller surgical patient population due to reduced surgical activity during various COVID lockdowns.

Regarding timing, the most common presentations occurred more frequently in the evenings (1800-2359 hours) followed by the afternoon (1200-1759 hours), consistent with the 'sundowning' phenomenon where psychomotor agitation or aggressiveness and cognitive disturbances like confusion, disorientation and wandering were common [13].

75.48% of codes involved physical aggression, with harm to others as the most prominent feature of brute force, such as punching a staff member. The use of weapons (18.57%) or the involvement of bodily fluids (10.71%) was lower but indicates the occupational risks that healthcare professionals encounter. Verbal abuse from patients was also a common cause of code greys (59.13%). Previous reviews have shown physical involvement to range from 18-76% and verbal abuse from 60-90% [4, 14, 16].

Demographics
Identifying characteristics of individuals or groups of people at higher risk of aggression or triggering a code grey call can help advise us on more efficient resource allocation for certain patient populations.

From our results, it is evident that most of the code grey aggravators were male. This aligns with previous studies on healthcare violence which had similar gender proportions [10]. A study on ICU delirium also showed males to be more susceptible to symptoms of hyperactive delirium including agitation, impulsiveness and combativeness, requiring antipsychotic management, despite similar rates of mental health comorbidities to females [11].

The average age of our patient cohort was 76.48 years, with a median of age 79.5 years. This is relatively higher than data found in previous studies reviewing workplace violence mainly in other settings like the ED and ICU, which showed mean and median ages to range from 25 to 42.325 years [8-10, 12, 15].

Patient Factors
The mean and median day of admission when a code grey was called was day 6.45 and 3 respectively. In the initial phase of our research audit (Part 1), it was discovered that the majority of our patients exhibited behaviors associated with delirium or dementia. In this extension of our project, we reviewed more detailed paper files which unexpectedly found that only 25% of the patients were given a definite diagnosis of delirium pre-code. However, this percentage increased to 48.56% post-code. An additional 42.06% of patients displayed behaviors suggestive of undiagnosed delirium, identified through keywords in the paper records around the time of code. These behaviors could not be attributed to other diagnoses and were unusual in comparison to the patients' baseline behavior. This leads us to a range of 48.56% to potentially 90.62% of our patients who may have been experiencing delirium at the time of code. These discrepancies in delirium diagnoses underscore the need for improvement in early delirium diagnosis, crucial for provision of more appropriate care and interventions to patients in the early stages of delirium, thus preventing their condition from escalating into "code grey" behaviors. Clinicians may sometimes refrain from providing a definitive delirium diagnosis in certain patients due to factors such as unclear etiology, insufficient information about the patients' baseline behaviors, especially with comorbid conditions like dementia, making it challenging to differentiate behaviors. There might also be reservations about unintentionally inflicting institutional stigma on the patients [21]. However, early diagnosis of delirium through objective assessments like the 4AT and laboratory screening is essential, not only to ensure safety and well-being of patients but also to safeguard healthcare workers from aggression resulting from unaddressed delirium. In Australia, both nurses and clinicians are authorized to assess and diagnose delirium. Given that nurses spend a substantial amount of time caring for patients, it may be worthwhile to consider implementing policies that encourage nurses to proactively diagnose or recommend investigations for potential delirium cases. This proactive approach can help ensure that patients at risk of delirium are not overlooked.

Primary bed cards were 2.72x more likely medical than surgical, despite surgery being a major risk factor for development of delirium. Post-operative delirium (POD) was found to have minimal contribution as a predisposing factor for our code grey patient population. Only 29.33% of patients had undergone a recent procedure within 28 days prior to their codes, and approximately half of them received a definite diagnosis of delirium. Consistent with previous studies that identified delirium as most common in the early post-operative period [18], 78.69% experienced their code event within the first 5 days after their procedure. Supporting our observation of a low proportion of POD patients, POD has been reported to manifest more frequently with hypoactive or mixed signs, while hyperactive manifestations resulting in aggression are rare [17]. Although surgical patients are more susceptible to severe delirium due to increased exposure to sedatives and anesthetics, one study found no significant difference compared to medical patients after adjusting for medication use [17]. It is also possible that the heightened awareness of POD has led to better surveillance and management of at-risk surgical patients in Cabrini, possibly explaining the lower rates of escalated aggression within the surgical group.

A substantial proportion of patients had a history of neurological and cognitive impairment at 56.25% and 50% respectively, primarily due to dementia. Aggression is common in dementia, and can be neuropathological due to prefrontal cortex atrophy [23], or associated with impaired expression of needs and discomfort such as unrecognised pain or dehydration, as well as delusions and hallucinations [20]. Such behaviours are recognised as BPSD, and occur in 60-90% of dementia patients [19]. Interestingly, in our study, BPSD was diagnosed in only 20.19% of patients with cognitive impairment, accounting for merely 26.92% of patients with dementia. These figures appear relatively low when compared to the general prevalence rates observed in dementia patients, suggesting that BPSD might be underdiagnosed within our cohort. Similar to the earlier discussion regarding delirium, diagnosing a patient with BPSD can carry a stigma, which might make clinicians hesitant to provide this diagnosis [22]. However, it is crucial BPSD is addressed rather than avoided to ensure improved communication and dignified care for these patients [22].

Around 1 in 3 of our patient cohort had a history of psychiatric disorder; aggressive behaviours have been described in association with certain psychiatric conditions [23].

Matching trends observed in our collective findings, previous studies have indicated that the coexistence of delirium or mental health diagnoses in inpatient dementia populations is associated with an elevated risk of aggression [24]. Thus, the implementation of a graded risk assessment for dementia patients upon admission to the ward, taking into account the presence of these two factors, is worth considering. Such an assessment could facilitate heightened monitoring, which may include assigning beds closer to the nurses' station or increasing one-on-one care as needed.

It's important to highlight that within our Code Grey patient cohort, a significant 76.44% of individuals exhibited escalating behaviors within 24 hours leading up to their Code Grey incidents. This observation underscores the potential for improved early management of patient agitation or aggression as a preventive measure against Code Grey situations.

Repeat Codes
21 patients were responsible for a total of 31 repeat codes. The mean and median day of admission for repeat subjects were 7.74 and 4, respectively, which was higher than that of the general cohort, as logically expected. Similarly, it is anticipated that repeat subjects had a higher proportion of PCAs present at the time of the code to provide 1-on-1 care, as well as being requested after the code. This indicates the graded personalized care given to these patients with greater unmet needs, as well as the heightened precautionary measures taken once patients have a history of code grey incidents.

A higher proportion of these patients had neurological impairment, cognitive impairment, as well as previous psychiatric history. Delirium was also better recognised within this cohort, with 1.52x higher rates of diagnosed delirium pre-code, and 1.47x lower rates of undiagnosed potential delirium. While the discrepancy in delirium diagnosis pre- and post-code was reduced in the repeat subject population from 23.56% to 19.04%, there is still a significant proportion of patients who took multiple code grey events for their delirium to be diagnosed formally. As such, there is still room for improvement on earlier diagnosis of delirium.

When comparing medication usage between the general and repeat subject populations, it is evident that the proportion of repeat subjects prescribed AP pre-code was 1.64x higher, and the use of BZ was 1.76x higher. This likely indicates the use of AP and BZ to address ongoing behavioral issues, which may have persisted from previous code incidents. It is worth noting that these medications are known risk factors for higher incidences of delirium and confusion [28], which might contribute to the recurrence of code events. Drug therapy does not necessarily aid in the resolution of delirium, and abstaining from pharmacotherapy can instead offer therapeutic benefits [29]. Thus, it could be worth considering minimizing the use of these medications for management of code greys, relying on improving non-pharmacological management where safe and possible. On the other hand, the proportion of repeat subjects on OP was 1.31x lower. While this indicates a cautious approach to using opioids in these patients, which is positive given opioids' role as a known precipitant of delirium and impulsivity, it's crucial to ensure that patients are still receiving adequate pain control. Studies have found that pain in agitated patients with dementia or delirium is frequently under-recognised, leading to the predominant administration of AP for these patients instead [27]. It is imperative we confirm that ongoing behavioral patterns do not stem from unaddressed pain, widely acknowledged as a significant contributing factor to aggression and distressing behaviors, especially among dementia inpatients [26].

The proportion of repeat subjects who had recently undergone procedures were half that of the general cohort. This supports previous findings that primary POD has relatively rapid recovery rates [25] and is not a significant factor for ongoing aggression.

Code Response
Nurses were most commonly the victims of physical harm in 64% of code grey and the most common personnel to respond (97.12%), followed by medical staff (50%). Security was only called to attend 32% of codes, while a hospital coordinator attended 28%.

Most patients (57.21%) received medications during the code; 7.56% of codes were managed with physical restraints. The literature shows that antipsychotic drugs have a limited role in delirium and that non-pharmacological approaches, such as reorientation, may have a role depending on the clinical context. Codes can be traumatic to staff involved, and some degree of mental harm was documented in 18.27% of cases, whereas debriefing was recorded in just 24.04% of codes. This suggests staff may benefit from additional support and policies post-code.

Outcomes
Around 10.58% of patients were referred to a psychiatrist for review after a code, given that 42.86% had an established psychiatric diagnosis. In addition, one-to-one care increased after a code, with 15.38% of patients having a PCA pre-code to 32.21% post-code. This could represent the underutilisation of psychiatry and PCAs as a resource in our hospital.

Only 48.56% of patients were diagnosed with delirium after a code, yet 22% had documented behaviours suspicious of delirium, such as confusion, disorientation and absconding, but were not diagnosed. Underdiagnosis of delirium during hospital admission has been observed in the literature [30, 31].

Some studies have shown an association between delirium and death subsequently occurring within a short period [32–34]. Our study showed that 8.47% of patients died within the same admission of their code grey.

CONCLUSION

Our data showed that increased age, male gender, and cognitive or neurological impairment were risk factors for code greys. Patients with multiple codes during hospital admission were likelier to have these characteristics. Such details could increase the ability to predict which patients are at increased risk for acute agitation at Cabrini. Taking more significant preventative measures such as utilising 1:1 personal care assistant staff, providing cues for orientation, encouraging cognitive stimulation or bringing in familiar objects can help mitigate disorientation and reduce the incidence of hospital aggression and delirium in general. With significantly higher rates of codes from patients in medical compared to surgical units, there may be a role for higher staffing levels, increased training and screening for delirium to reduce the potential onset of patient aggression in medical units. Further research is needed to determine if code greys are underutilised in other hospital areas.

Our data also indicated delirium may be underdiagnosed in patients; only 48.56% of patients were diagnosed with delirium after a code, yet 22% had documented behaviours suspicious of delirium, such as confusion, disorientation and absconding, but were not formally diagnosed. Patients without a diagnosis are likely to be deprived of appropriate community follow-up.

Antipsychotics and benzodiazepines are widely utilised within our study group. Preventative strategies, stricter protocols and restrictions might help minimise unnecessary use, and encourage engagement of non-pharmacological interventions first. Adequate pain management should also be ensured for patients, especially those who are less able to communicate their needs or express themselves effectively such as dementia and delirium patients.

Limitations of our study are the single-site design and potential measurement bias associated with retrospectively reviewing riskman, EMR and paper documentation. Future research directions could include reviewing delirium screening systems such as 4AT and doses of antipsychotic medications administered during codes.

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