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Care pathways, engagement and outcomes associated with a recovery-oriented intermediate stay mental health program

Ketrina A. Sly^{*a,b,c,d}, Terry J. Lewin^{a,b,c,d}, Barry G. Frost^{d,e}, Srinivasan Tirupati^{a,c}, Megan Turrell^a, Agatha M. Conrad^{a,b,c,d}

^a Hunter New England Mental Health Service, PO Box 833, Newcastle, NSW 2300, Australia.

^b Centre for Brain and Mental Health Research (CBMHR), The University of Newcastle, Callaghan, NSW 2308, Australia.

^c School of Medicine and Public Health, Faculty of Health and Medicine, University of Newcastle, Callaghan, NSW 2308, Australia.

^d Hunter Medical Research Institute (HMRI), New Lambton, NSW, 2305, Australia.

^e School of Psychology, Faculty of Science and Technology, University of Newcastle, Callaghan, NSW 2308, Australia.

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E-mail addresses:

Ketrina A. Sly*: Ketrina.Sly@health.nsw.gov.au

Terry J. Lewin: Terry.Lewin@health.nsw.gov.au

Barry G. Frost: Barry.Frost@newcastle.edu.au

Srinivasan Tirupati: Srinivasan.Tirupati@health.nsw.gov.au

Megan Turrell: Megan.Turrell@health.nsw.gov.au

Agatha M. Conrad: Agatha.Conrad@health.nsw.gov.au

*** Corresponding author:**

Ketrina A. Sly, MH-READ Unit, Centre for Brain and Mental Health Research, University of Newcastle, Callaghan, NSW 2308, Australia. *Telephone:* +61 2 40335707; *Fax:* +61 2 40335692; *Email:* Ketrina.Sly@health.nsw.gov.au

Abstract

This study examined care pathways, program engagement, and key outcomes associated with a sub-acute inpatient stay in a 20-bed stand-alone Intermediate Stay Mental Health Unit (ISMHU; NSW, Australia). A 6-week evidenced-based tailored intervention program was offered, utilising a recovery-oriented model of care. Service data from multiple record systems were combined, including admissions and service contacts 2-years prior to and following the index admission. During the initial 16-months there were 146 index admissions with a length of stay greater than 7 days. The majority (75.3%) were transfers from acute-care, with an average ISMHU stay of 50.3 days. Service and clinical outcomes were examined in relation to care pathways, recovery needs, program engagement and benefits achieved. Substantial engagement was detected (e.g., 74.0% >10 intervention types), together with significant improvements on self-report and clinician rated measures (e.g., social connection, symptoms, and self-belief). Logistic regression analyses revealed that arrival category was the strongest outcome predictor, with community referrals experiencing the largest reduction in subsequent acute mental health admissions (58.3% to 16.7%), followed by involuntary inpatient referrals (80.3% to 60.7%). Potential recovery-focused benefits are not limited to community treatment settings, while pathways to care may help identify clients with differing needs and opportunities for treatment.

Keywords: Mental health services; Inpatient; Sub-acute; Health service utilisation; Psychiatric rehabilitation; Recovery Star; Clinical outcomes.

Highlights:

- Community referrals potentially avoided an acute MH admission or subsequent transfer
- Program engagement & recovery domain improvements occurred across arrival categories
- Clinical improvement was rated higher for community & involuntary inpatient referrals
- Arrival category was associated with service patterns & the strongest outcome predictor
- Community referrals had the largest reduction in MH admissions & community contacts

1. Introduction

1.1. Provision and evaluation of recovery-oriented mental health services

Australian mental health services (MHS) are generally regarded as comprehensive, high-quality and innovative. A series of reforms during the past few decades have strengthened MHS provision and contributed to the development of models-of-care based around community and mainstream health initiatives (Australian-Health-Ministers, 2009). However, concerns have also been raised about the capacity of these models to support improved outcomes across the spectrum of need, and about the availability and mix of acute and sub-acute beds (Allison et al., 2014; Hewlett and Moran, 2014). For example, Allison and Bastiampillai (2015) suggested that reductions in psychiatric beds (below Organisation for Economic Co-operation and Development average) have adversely impacted on care and outcomes, effectively restricting services for high-risk individuals (Hickie et al., 2005).

Mulder et al. (2017) advocated for a broader vision, proposing that if current MHS treatments were effective there should be fewer crisis presentations, lower reliance on disability support pensions, and improved wellness and social inclusion. Similarly, Morgan et al. (2017) concluded that whilst people with psychotic illnesses were typically optimistic, factors such as money, social engagement and employment remained significant challenges; advocating for a personalised and holistic approach to recovery. Arguably, enabling individuals to assume greater responsibility for their own recovery and achieve better outcomes requires a significant realignment of the core principles and values underlying MHS provision.

Internationally, the focus on recovery-oriented MHS provision is intensifying, related to translating policy into practice, as well as evaluating its effectiveness (Frost et al., 2017a; Kilbourne et al., 2018; Pincus et al., 2016; World-Health-Organisation, 2013). Recent conceptualisations focus on clinical, personal, and service-defined recovery (Le Boutillier et al., 2015a), in part, framing recovery translation into practice according to the goals/needs of an organisation. From this standpoint, specialised service-led recovery streams need to be provided, which are reflective of the

complexity of client needs, stage-of-recovery, and available resources (Copic et al., 2011; Le Boutillier et al., 2015a), that enhance mental health (MH), life skills, functioning, independence and wellbeing, and promote strengths and recovery potential (Meadows et al., 2019).

Notwithstanding, the adoption of recovery frameworks and best practice guidelines has been challenging, constrained by traditional biomedical approaches and management imperatives, as well as conflicting demands (Le Boutillier et al., 2011; Le Boutillier et al., 2015b). Achieving an appropriate balance between clinical and personal recovery (Slade, 2010) is essential for MHS. This necessitates incorporating consumer descriptions of personal wellbeing and social inclusion (Jose et al., 2015), collaborative recovery-focused practice (Happell and Scholz, 2018), and adequate assessments of reductions in unmet needs (Allison and Bastiampillai, 2015; Heyeres et al., 2018). Effective evaluations of interventions supporting recovery are also required, particularly within public MHS (Rogers, 2019), and increased understanding of relationships between changes in recovery and clinical domains (Slade et al., 2012).

1.2. Australian recovery-oriented sub-acute MH care

In Australia and elsewhere, it has been increasingly acknowledged that recovery is an individual and dynamic process as well as an outcome (Anthony, 2000), that recovery-pathways can be complex and non-linear, and that factors such as hope may be critical in sustaining improvements and social inclusion (Copic et al., 2011; Weinberg, 2013). Our national recovery framework called for a re-alignment of MHS, focusing on service-users' aspirations, needs, and greater responsibility in their care (Commonwealth of Australia, 2013). Within this framework, clinical recovery has been characterised as '*a reduction or cessation of symptoms and restoration of social functioning*' (Victorian Department of Health, 2011) and personal recovery as '*creating and living a meaningful and contributing life with or without MH issues*' (Commonwealth of Australia, 2013).

‘Sub-acute MH care’ includes specialised inpatient MHS and community-based MH support services (e.g., residential and supported accommodation). Several recovery-focused sub-acute MH inpatient units have been introduced across New South Wales (NSW), operating under differing models-of-care. Two important factors in the provision of effective recovery-based practice have been identified by an Illawarra unit: attracting/retaining staff with a belief “*that recovery is possible*” and a clear model-of-care guided by external implementation expertise (Panesar et al., 2011). A recent Victorian randomised study of recovery-oriented staff training, conducted in MHS and community MH support services, revealed modest improvements in consumers’ personal recovery at services receiving the intervention (Meadows et al., 2019), consistent with UK findings (Slade et al., 2015).

Some residential recovery-focused sub-acute services have also been evaluated (Heyeres et al., 2018; Lee et al., 2014; Thomas et al., 2015; Thomas et al., 2017). A Canberra facility identified improvements in symptoms and functioning among individuals transitioning from inpatient care, as well as community admissions (Thomas et al., 2017). Additionally, a Prevention And Recovery Care (PARC) service in North Queensland (maximum 28 day LOS) (Heyeres et al., 2018) demonstrated a reduced reliance on acute inpatient beds and cost-effectiveness (Kinchin et al., 2019). Similarly, a systematic review found that MH supported accommodation services were effective across a range of psychosocial domains; however, outcome comparisons across differing service models were challenging (McPherson et al., 2018).

Studies examining service-use patterns among individuals with serious and persistent mental illnesses (SMI) reveal consistently high acute admission rates, MHS and non-government organisation (NGO) service-use, and ongoing social isolation (Morgan et al., 2012; Neil et al., 2014). Until recently, recovery-oriented practice has predominately occurred in community settings. Moreover, little is currently known about the success of integrating recovery-oriented practice into inpatient settings (Waldemar et al., 2016), particularly in sub-acute units. One initial strategy would

be to evaluate whether the benefits achieved during an admission, or in subsequent service based outcomes, are specific to subgroups with different needs, care pathways or program engagement.

1.3. Purpose of this paper

This ongoing evaluation project seeks to quantify service-users' characteristics and the key personal, clinical and service outcomes achieved following the establishment of a sub-acute Intermediate Stay Mental Health Unit (ISMHU) within the Hunter New England Local-Health-District (HNE-LHD). The ISMHU clinical model-of-care fits within the broader framework of an integrated recovery-oriented model (IRM), incorporating specialised clinical rehabilitation (CR) approaches promoting remediation, restoration and reconnection (Frost et al., 2017a). Within the IRM, sub-acute inpatient care is only one component of service provision, in collaboration with other specialist MHS (e.g., substance misuse, neuropsychiatry) and community-based services (e.g., General Practitioners, accommodation, vocational, and community programs). Underpinned by the MH Recovery Star framework (MacKeith and Burns, 2010), ISMHU provides an evidenced-based tailored intervention program based around a 6-week length of stay (LOS), targeted towards improving functioning, self-determination and social inclusion (Frost et al., 2017b).

The aims of this paper were to: 1) characterise care pathways, and specifically where in clients' illness/recovery trajectories the index sub-acute admission occurred; 2) quantify their level of program engagement and the benefits attained; 3) report on key, predominantly service-focussed outcomes following the sub-acute admission, and specifically acute MH admissions during the subsequent 2-years; and 4) explore differential benefits across subgroups, opportunities for practice change, and wider service development/evaluation. In broad terms, it was hypothesised that increased engagement in targeted programs would result in significant improvements in both clinical and personal recovery outcomes during the sub-acute stay and contribute to reduced subsequent acute MH admissions.

2. Methods

From November 2010, community and acute inpatient MHS clients were referred to the ISMHU for a planned sub-acute recovery-oriented admission. Typically, this occurred in consultation with MH rehabilitation clinicians embedded in services, on the basis of a collaboratively identified need for ongoing CR and a willingness to engage in the program. Prior to admission, clients received an information booklet outlining the unit's philosophy and programs and signed a voluntary participation agreement. ISMHU program elements and implementation strategies have been detailed elsewhere (Frost et al., 2017b).

2.1. Participants and data sources

Clients selected were aged between 16-65 years and had identified recovery needs that could be suitably addressed within a 6-week sub-acute stay (and/or appropriate steps initiated). Primary data sources were medical records, collaborative assessments, or routine observations/ratings by clinicians within participating MHS. During a 16-month period (November 2010 to April 2012) there were 146 index admissions with a LOS greater than 7 days. Service-level data, including clinical and demographic characteristics, were obtained for all admissions from local electronic and paper based clinical records [via the regional Inpatient Management System (IPMS) and Clinical Information Department (CID)]. In addition, admission and community service utilisation data in the 2-years prior to and following the index ISMHU admission were collated (via IPMS) in order to evaluate illness/recovery care pathways, key service and clinical outcomes.

2.2. Measures

2.2.1. Intervention log

A range of individual and group interventions addressing client needs and priorities were available for all program participants (see Table 1, Frost et al., 2017b), with the choice of interventions undertaken driven by the client. In-situ interventions were also regularly provided but not formally documented (e.g., reinforcement of strengths and skills; encouragement of cooperative

and respectful social interactions). Group and individually tailored interventions received were recorded by each client's care-coordinator, utilising an intervention log attached to their medical record. When this was not available, a retrospective file review was undertaken by a member of the clinical research team to record interventions received, in accordance with the log. With respect to intervention log listings, 40 items were noted (11 group programs, 2 family/carer related group programs, 23 individually tailored interventions, and 4 linkage related interventions to specialised and community services). As some elements within these interventions overlapped, 19 aggregate intervention categories were recorded across the admission, covering three sub-domains (see Table 2), with program engagement quantified as: low (0-10); medium (11-13); or high (> 13 intervention types).

2.2.2. *Mental Health Recovery Star (MHRS)*

The MHRS (MacKeith and Burns, 2010) is a validated collaborative tool (Dickens et al., 2012; Killaspy et al., 2012) for assessing/discussing recovery needs, goals and priorities, which guides ISMHU care planning and interventions. Three MHRS subscales have been identified (Frost et al., 2017b), which average subsets of domains: '*Symptom management and functioning*' (Physical health and self-care; Managing MH; Work; and Living skills), '*Self-belief*' (Addictive behaviour; Identity and self-esteem; Trust and hope; and Responsibilities); and '*Social connection*' (Relationships; and Social networks). All available ISMHU-related MHRS data were downloaded from the associated online program and supplemented by a search of clinical records (for additional MHRS paper forms). Where possible, two sets of ratings were identified, within a few days of admission and discharge. Improvement from admission to discharge was categorised by reductions in the number of domains under 6 (i.e., at the pre-action stage). Improvement in two or more recovery domains was regarded as an 'improved stage-of-change', with a change on less than two domains categorised as 'minimal improvement' (below the median).

2.2.3. *Health of the Nation Outcome Scale (HoNOS)*

HoNOS (Wing et al., 1998) is a clinician rated routine service measure, collected as part of the Australian national outcomes set (Burgess et al., 2015), which has been found to display good construct and predictive validity, adequate test-retest and inter-rater reliability, and sensitivity to change (Orrell et al., 1999; Pirkis et al., 2005). All available ratings were obtained via the Clinical Information and Management Exchange (CHIME). Admission and discharge HoNOS ratings were often completed by different ISMHU clinicians. The 12 items (assessing problems with behaviour, impairment, symptoms, and social functioning) are rated on a 5-point scale [(0) ‘no problem’ to (4) ‘severe to very severe problem’], with higher scores indicating poorer MH (Wing et al., 1998). HoNOS symptom severity on ISMHU admission was categorised as: mild (0-9); moderate (10-12); or severe (13-48). ‘Clinically meaningful improvement’ was categorised as a HoNOS change score of 4 or more from admission to discharge (Parabiaghi et al., 2014).

2.2.4. *Index admission and service-use measures*

Service usage data were initially classified with respect to five time periods: T1) 1 to 2 years pre (index ISMHU admission); T2) within 1 year pre; T3) associated with the index ISMHU admission (including any contiguous acute admissions before or after the index admission); T4) within 1 year post; or T5) 1 to 2 years post. With the exception of time period T3, aggregate acute MH admissions (number, and days), community contact days, and combined service contact days per person/year (/yr) were calculated. Acute MH admissions were categorised as voluntary or involuntary, based on the most restricted legal status during the relevant admission sequence. ISMHU arrival category was categorised as: community referral (i.e., no contiguous prior acute admission); inpatient/voluntary, or inpatient/involuntary (as part of the acute stay). Year-by-year profiles were examined to characterise illness/recovery trajectories; however, the main binary service outcome measure was presence or absence of any acute MH admissions within 2-years post the index ISMHU admission (T4 and T5). Based on preliminary analyses, and given the absence of

any external comparison (e.g., comparable clients without an ISMHU admission), arrival category was regarded as the most appropriate basis for undertaking internal subgroup comparisons examining patterns/changes.

2.3. Statistical analyses

SPSS statistical software (Version 24.0; Armonk, NY, USA) was used for data coding and analyses. Simple associations between categorical variables were examined using chi-square tests, while paired t-tests were used to assess change between phases and from admission to discharge. Relationships between intervention counts within sub-domains were examined using Pearson product-moment correlations, with two-tailed significance. Hierarchical logistic regressions were employed to evaluate predictors of post ISMHU acute MH admission status, with a pre-determined order of variable entry reflecting a mixture of chronological, clinical and data availability factors; and utilising adjusted odds ratios (AORs) as the reporting metric. As a partial control for the number of statistical tests, the threshold for significance was set at $p < 0.01$, although trends ($p < 0.05$) are also noted.

3. Results

3.1. Client characteristics

As shown in Table 1, 110 admissions (75.3%) were transfers from an acute inpatient facility and 36 (24.7%) were from the community. Average LOS was 50.3 days (or 43.2 days excluding leave periods), although 22.6% had shorter (≤ 40 days) and 24.7% longer stays than planned (> 60 days). A stay typically included at least 2 periods of incremental leave, totalling on average 7.1 days, with the first leave period commencing around day 28 (no transitional leave: 13.7%; 1-2 separate leave periods: 37.7%; and multiple leave periods: 48.6%); while 41 clients (28.1%) were discharged following leave from the unit. The majority of clients were male (72.6%), admitted voluntarily (58.2%), and aged between 25-54 years (84.9%). Common diagnoses were:

schizophrenia/related disorder (75.3%); depression/anxiety (52.1%); and substance use disorders (40.4%); with high rates of comorbid psychosocial (94.5%) and physical health (88.4%) problems reported. On discharge, only 6.8% of admissions required transfer to an acute inpatient facility, with all 10 clients having been initially transferred from an acute unit.

TABLE 1 HERE

3.2. Intervention engagement

There were 2,604 intervention log listings (mean=17.84 items, SD=5.19), comprising: 35.2% group programs; 3.8% family/carer related group programs; 46.0% individually tailored interventions; and 15.0% service linkage related interventions. As shown in Table 2, clients typically received just under two-thirds of the 19 available intervention types (median 12). The majority received interventions targeting symptoms and functioning (median 6/8), while around two-thirds received broad based interventions (median 4/6), which included linkages with other community, specialist MH and NGO services. Slightly fewer received interventions aimed at improving self-belief and social connection (median 3/5). Overall, 26.0% of clients experienced low program engagement (i.e., 0-10 intervention types). There was no significant association between arrival category and level of ISMHU program engagement ($\chi^2_{(4)}=0.52, p=0.97$).

TABLE 2 HERE

3.3. Improvements during index admission

Table 3 summarises MHRS ($N=96$) and HoNOS ($N=82$) change profiles. On admission, the highest level of need based on mean MHRS subscale scores was in the area of *social connection*, followed by *symptom management and functioning*. There were significant improvements in self-reported overall symptom severity and on each subscale (mean change: 1.53 for *social connection*; 1.40 for *symptom management and functioning*; and 1.01 for *self-belief*). Clients exhibiting an improved MHRS stage-of-change ($N=59, 61.5%$) had a mean reduction of 4.24 in the number of pre-action recovery domains. Clinician rated HoNOS scores for those with ‘clinically meaningful’ symptom improvement ($N=35$) reduced by a mean of 8.2 points. MHRS improvement category was

not associated with arrival category ($\chi^2_{(2)}=0.50, p=0.78$) or level of ISMHU program engagement ($\chi^2_{(2)}=0.53, p=0.77$). However, HoNOS improvement category was associated with arrival category ($\chi^2_{(2)}=11.60, p=0.003$) but not with program engagement ($\chi^2_{(2)}=2.32, p=0.31$). Clinically meaningful improvement on the HoNOS occurred less often among voluntary inpatient referrals (15.4%) compared with the other arrival categories (55.4%).

TABLE 3 HERE

3.4. Admission pathways and service utilisation patterns

Based on service-level data during the preceding two-years (T1 and T2), the cohort as a whole was increasingly symptomatic during the 12-months prior to their ISMHU admission, with a tendency for different service patterns across arrival categories. As shown in the right-hand columns of Table 1, acute MH admission rates were somewhat higher (54.1% vs. 36.3%) during the year preceding the ISMHU admission relative to the previous year ($\chi^2_{(2)}=9.76, p<0.01$). This was accompanied by a 10.38 (SD=33.72) day increase in the mean number of community service contact days/yr ($p<0.001$) and a 16.95 (SD=54.11) days/yr increase in overall contacts ($p<0.001$).

Several Supplementary Tables (S1 to S3) were prepared to improve our understanding of acute admission, service-use and client characteristic profiles by ISMHU arrival category. In short, as shown in Table S2, community referrals to ISMHU had the highest number of community MHS contacts (mean=41.33, SD=45.83) in the year preceding the index admission, an increase of over 16.41 days/yr on the previous year. Clients referred to ISMHU following a voluntary acute admission experienced a mean increase of 12.69 acute admission days/yr during the preceding year, with relatively longer hospital stays when they were admitted (i.e., LOS=10.03 days longer, see Table S1). While clients referred to ISMHU following an involuntary acute admission also experienced high service contacts during the preceding year, they displayed a more stable pattern (e.g., a consistently higher proportion of involuntary admissions, and similar LOS when they were admitted). The observed patterns of deterioration in the 12-months preceding the ISMHU admission are illustrated on the left-hand side of Figure 1. The level of deterioration/acuity (and/or case

complexity) is further evidenced by LOS data for contiguous prior acute admissions (T3): mean = 30.65 (voluntary) and 57.07 (involuntary) days, which were substantially longer (by 90% and 151%, respectively) than equivalent admissions during the preceding 12-months (see Table S1).

FIGURE 1 HERE

In the year following the index ISMHU admission (T4), community MHS contacts remained uniformly high across all groups (mean=42.03; SD=35.60). However, there was a significant decrease of 11.40 days/yr (SD=29.87) in community MHS contacts ($t_{(145)}=4.61, p<0.001$) and 12.78 days/yr (SD=57.11) in overall service contacts ($t_{(145)}=2.71, p<0.01$) during the subsequent year (T5, see Table S2). Comparisons between the same pair of time points revealed relatively stable patterns of acute MH admissions (see Tables S1 and S2), except that the small number of subsequent admissions by ISMHU community referrals tended to be substantially longer (9 admissions, mean LOS=56.89 days), compared with an average of 28.14 days (for 148 admissions) during the post ISMHU years, which itself was longer than the average during the pre ISMHU period (220 admissions, mean LOS=19.36 days). Changes in service contacts post the ISMHU admission are further illustrated on the right-hand side of Figure 1.

Table S3 details the number of clients with *any* acute MH admission during the aggregate two-year time periods by arrival category. Two characteristics stand-out: the high rate of prior involuntary admissions (70.5%) by those with a contiguous involuntary admission at ISMHU arrival (which fell to 45.9% subsequently); and the pre to post reduction in any acute MH admissions (from 58.3% to 16.7%) by those referred to ISMHU from the community. Overall, 66.4% (N=97) of clients had a T1-2 acute MH admission, falling to 46.6% (N=68) at T4-5, with a median time of 33.3 (mean=41.3, SD=33.4) weeks to their first post ISMHU readmission.

3.5. Predictors of service outcomes

The primary outcome variable for the logistic regression analyses was acute MH admission status within the 2-years following the ISMHU admission (0: no admissions vs. 1: any acute

admission). There were six socio-demographic and clinical/service history predictors: age; gender; diagnosis; admission history in the preceding year (step 1); community contacts in the preceding year; and ISMHU arrival category (step 2). Community contacts were included at a later step, as such contacts are likely to increase as a result of having had an acute admission. Five main engagement and clinical characteristics predictors were also included: level of ISMHU program engagement (step 3A); number of MHRS pre-action domains on admission (step 3B); HoNOS symptom severity on admission (step 3C); as well as improvement on the MHRS (step 4A), and HoNOS (step 4B) from admission to discharge. As MHRS and HoNOS ratings were only available for a subset of clients, they needed to be included in separate analyses.

TABLE 4A & 4B HERE

As shown in Table 4A, clients with a discharge diagnosis of schizophrenia/related disorder (51.8% readmitted, AOR=3.00), or a history of multiple admissions in the preceding year (66.7% readmitted, AOR=3.14) were around 3 times as likely to have an acute MH readmission in the subsequent two-years. Those who were transferred to ISMHU following an acute admission, as either a voluntary ($p<0.01$) or involuntary ($p<0.001$) inpatient, were significantly more likely compared to those referred from the community (16.7%) to have an acute readmission within 2-years; with voluntary (51.0%, AOR=7.46) and involuntary inpatients (60.7%, AOR=9.15) being respectively around 7 and 9 times more likely to be readmitted. As shown in Table 4B, the level of ISMHU program engagement, MHRS stage-of-change and symptom severity on admission, and improvements in MHRS and HoNOS ratings were *not predictive* of subsequent readmission within 2-years.

TABLE 5 HERE

To assist with interpretation/illustration of the various findings and their likely service implications, Table 5 provides a snapshot of client characteristics by arrival category and identifies potential ISMHU stay related benefits.

4. Discussion

One of the over-arching goals of sub-acute MH care is to impact positively on illness/recovery trajectories. This study provided an opportunity to examine key clinical, personal and service-level outcomes among individuals with an enduring SMI admitted to an intermediate stay sub-acute MH facility operating under a unique clinical model-of-care (Frost et al., 2017b), within a broader IRM for MHS (Frost et al., 2017a). For many clients, the decision to volunteer for the ISMHU program would have been challenging, as it represented a significant departure from their daily routine, prior experiences and responsibilities. Importantly, recovery plans were collaboratively developed and interventions were provided within a positive milieu focused on self-determination. By analysing combined service-data, we were able to explore variations in the potential benefits of a sub-acute stay, depending on a client's recovery needs, program engagement, and service/treatment expectations. There were shared benefits across client subgroups (e.g., substantial program engagement, improvements in recovery stage-of-change) as well as differential benefits depending on referral category (see Table 5) or other characteristics, suggesting that a 'one-size-fits-all' approach to sub-acute MH care provision would miss important recovery-focused intervention opportunities.

Service-level data revealed that clients selected for ISMHU were becoming increasingly symptomatic in the 12-months prior to admission. While diagnostic profiles were comparable, service utilisation patterns differed on the basis of arrival category, illustrating illness persistence/severity or functional differences. Inpatient referrals had contiguous acute admissions prior to ISMHU transfer that were twice as long in comparison to the prior 2-years; with the majority of involuntary inpatients (70.5%) having had prior acute involuntary admissions. It is unlikely that these longer than usual contiguous acute admissions were the result of the unavailability of sub-acute beds, but perhaps they were influenced by a lack of alternative longer-stay or community placement options. Immediately following the index admission, community

MHS contacts continued to increase regardless of arrival category (see Figure 1), reflective of an ongoing care-episode and associated post-discharge service engagement.

The MHRS on admission identified social connection as the highest level of need or intervention priority, shown previously to be protective and a strong predictor of subsequent MH (Saeri et al., 2018). In our study, the subgroup with improved MHRS stage-of-change had larger social connection improvements, followed by symptom management and functioning, and self-belief (see Table 3). This is consistent with sub-acute residential services reporting improvements in symptoms, relating to self/others and daily/living functioning (Lee et al., 2014; Thomas et al., 2017). The finding that improvements occurred irrespective of interventions received may be reflective of the unit's overall positive milieu or the additional impact of in-situ interventions not captured by the log. Studies evaluating recovery-oriented staff training interventions within public MHS report similar modest improvements in clinical and personal recovery (Meadows et al., 2019; Slade et al., 2015). On the other hand, a much smaller proportion of voluntary inpatient referrals were rated by clinicians as exhibiting clinically meaningful HoNOS improvement during their sub-acute stay. Perhaps the shift from a voluntary 4-week acute stay to a 6-week ISMHU admission was a less challenging transition for this group, and not accompanied by altered expectations or motivation for change. Similarly, Thomas et al. (2017) reported HoNOS improvements among both community and inpatient referrals, including lower mean symptom and change scores for inpatient referrals during sub-acute care, suggesting symptoms tended to stabilise during acute-care.

Clients referred to ISMHU from the community potentially avoided an acute admission. They also had the largest reduction in any acute MH admissions, and in subsequent community MHS contacts. Consistent with recent evaluations of residential sub-acute care (Kinchin et al., 2019), involuntary inpatient referrals also experienced reductions in subsequent acute admissions. With respect to IRM phases or components (Frost et al., 2017a), community referrals could potentially be characterised as open to the benefits of a sub-acute stay, seeing it as an opportunity for "*restoration*" (i.e., regaining competencies and hope) in a supportive environment and

avoidance of the disconnection typically accompanying acute admissions. By contrast, inpatient referrals to ISMHU probably had a mixed experience, associated with moving from a restricted acute environment (or custodial, in the case of involuntary inpatients) emphasising “*remediation*” (i.e., recovering psychological and physical functioning) to a less restrictive and supportive sub-acute setting focusing on “*restoration*” and then “*reconnection*”. Congruent with this, Thomas and Rickwood (2016) conducted semi-structured interviews among sub-acute residential clients, finding community referrals preferred social skills and illness management support, whereas inpatient referrals preferred a less structured environment, and assistance with living skills and aspects of personal recovery.

As clients were identified for possible ISMHU admission on the basis of a range of factors, it would be difficult to predict from admission characteristics alone who would have optimal outcomes. What was able to be determined was that clients referred from the community benefitted most and were likely to continue to be successfully managed, largely in the community; as reflected by subsequent community MHS contacts and a lower mean number of acute-care days/yr. Clients with a diagnosis of schizophrenia/related disorder, or a history of multiple admissions in the preceding year, were 3 times more likely to have an acute readmission in the following two-year period (see Table 4A). However, it is important to emphasise, in line with the IRM framework (Frost et al., 2017a), that recovery is a non-linear process and that illness persistence and other characteristics will continue to impact recovery trajectories; consequently, potential benefits of CR will differ and be inter-dependent with an individual’s recovery journey.

Interestingly, and contrary to our hypothesis, categories based on program engagement, recovery stage-of-change, symptom severity, MHRS or HoNOS improvements were not predictive of the likelihood of subsequent readmission (see Table 4B). However, these factors may well be related to other aspects of recovery. In following up this cohort, it was apparent that (currently) community MHS do not routinely collate information about other important aspects of functioning, such as: social reconnection, involvement in community activities, quality-of-life, or capacity to

return to work/study. As such, available service-data did not facilitate a fuller examination of program impacts on wellbeing or recovery progression, particularly in between illness episodes.

The second Australian National Survey of Psychosis included a cohort of public MHS users (N=1,211) with comparable characteristics to our sample (e.g., 60.0% male, 71.7% schizophrenia/related disorder, 37.6% MH admission in last 12-months), which revealed that 59.4% experienced ‘multiple episodes with good/partial recovery’ and 32.9% had a ‘chronic or deteriorating’ course of disorder (Morgan et al., 2012). Additionally, assessments of 12-month functional and vocational outcomes revealed: 64.2% experienced obvious or severe dysfunction in socialising, and 32.4% in quality of self-care; 87.4% received a pension; 30.5% were in paid employment, with 19.0% undertaking formal studies (Morgan et al., 2012). Mapping our ISMHU clients onto these national profiles, it is likely that the majority of our community referrals were in the ‘multiple episodes with good/partial recovery in between’ category, and that the majority of involuntary inpatient referrals had a ‘chronic or deteriorating illness’, with the voluntary inpatient referrals having a more mixed illness/recovery profile, including periodic acute admissions.

Our clinical recommendation would be that in order to evaluate longer-term benefits associated with recovery-oriented practice, additional elements of client functioning and needs should be assessed (Allison and Bastiampillai, 2015); ideally, including consumer generated descriptors and narratives (Jose et al., 2015), routinely captured alongside service measures, in collaboration with consumers, NGOs and other carers/agencies. Based on our findings, and consistent with the literature, clients with an enduring SMI will continue to require acute, sub-acute and community MH care. In order to provide and evaluate recovery-oriented services that match both personal and clinical needs, measures are required that adequately document community functioning and other domains of personal recovery, including during periods of wellness.

4.1 Strengths and limitations

A real benefit of the 6-week sub-acute inpatient program was the capacity to provide individual and in-situ psychosocial interventions in a structured and supportive environment, with around half of all interventions being individually tailored. Another clear strength was the collaborative use of the MHRS (in addition to other measures) to assess clients' stage-of-change and functioning across ten recovery domains. Participants represented a group of high service-users, with an enduring SMI and high levels of unmet need (e.g., typically, 4.53 MHRS domains at pre-action stage), who, in consultation with a MH rehabilitation clinician, volunteered for a sub-acute recovery-oriented stay.

Two '*potential threats*' to the validity of the study's findings (Shadish et al., 2002) can be characterised as '*selection bias*' (e.g., disproportionate referral of individuals who were most likely to benefit) and '*researcher bias*' (e.g., an internal program evaluation, as opposed to an independent review). Importantly, criteria for ISMHU admission/transfer were minimal (e.g., age and identified need) and comparable engagement strategies were applied to potential community and inpatient referrals. The evaluation team comprised experienced researchers and clinicians, who contributed to the unit's establishment and model of care (Frost et al., 2017a; Frost et al., 2017b). However, team members did not conduct any of the individual client assessments or influence associated care or referral decisions. Consequently, in many respects, the current study was similar to other evaluations of (quasi-experimental) interventions, with the potential utility of the findings likely to be enhanced through replication in similar settings elsewhere.

Moreover, data for all admissions to the program were included, examining aspects of personal, clinical and service-level recovery outcomes, including service usage data over an extended period (i.e., 2 years pre and post the index admission). However, given the complexity of undertaking research within service-contexts, there was an absence of a direct comparison group (i.e., with similar characteristics but not referred for sub-acute care); which was partially offset by undertaking internal subgroup comparisons based on arrival category. In addition, we did not assess

ongoing personal recovery in between illness episodes, in order to determine whether the psychosocial and service linkage elements of the program had a sustained benefit across recovery domains (e.g., social connection, quality-of-life, hope and wellbeing). Utilisation of client interviews post-discharge exploring program engagement, service provision and unmet needs would have also been beneficial. These deficits need to be addressed in future evaluations of sub-acute MH care, both within our services and elsewhere.

4.2 Conclusions

Our findings reinforce calls to target recovery-focused interventions based on client's needs, preparedness to engage, and stage-of-recovery (Copic et al., 2011; Le Boutillier et al., 2015a). While the factors that promote and sustain recovery are complex, insight was obtained into each client's personal recovery journey using a collaborative tool in treatment planning, and further evidenced by care pathways and program engagement. Arrival category was the most useful single predictor of improved service outcomes, with larger discernable changes among the community and involuntary inpatient referrals. Improved documentation of care pathways, and course of disorder, may help identify relatively distinct client subgroups, with differing recovery needs and opportunities for treatment. Irrespective of referral pathway, there were clear improvements in individualised recovery domains during the sub-acute stay. Consequently, recovery-focused benefits are not limited to community treatment settings. Further research is required aimed at evaluating the benefits of recovery-oriented models-of-care within sub-acute inpatient MHS, examining specific medium-term as well as sustained recovery outcomes.

Declarations

Conflict of interest: The authors declare that they have no competing interests.

Ethical approval: This project was viewed as an internal, low risk study and exempted from the requirement of a formal regional ethics committee application (Hunter New England Human Research Ethics Committee, letter dated October 24th 2013). ISMHU clients were provided with an information booklet and asked to sign a program participation agreement; however, they were free to withhold consent for any individual measures or program components. Routine service and outcome data were collected in accordance with the NSW Health Records and Information Privacy Act 2002.

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Abbreviations

ISMHU: Intermediate Stay Mental Health Unit; MHS: Mental Health Services; MH: Mental Health; LOS: Length of Stay; SMI: Serious Mental Illness; NGO: Non-Government Organisation; NSW: New South Wales; HNE-LHD: Hunter New England Local Health District; CBMHR: Centre for Brain and Mental Health Research; IRM: Integrated Recovery-oriented Model; IPMS: Inpatient Management System; CID: Clinical Information Department; MHRS: Mental Health Recovery Star; HoNOS: Health of the Nation Outcome Scale; CHIME: Clinical Information and Management Exchange.

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Table 1. Sample characteristics at index ISMHU admission ($N = 146$)^a

| Socio-demographic characteristics | N (%) | MH Service use per year during the 2 years prior ^c | T1: 1-2 years pre N (%) | T2: Within 1 year pre N (%) | Statistical Comparison |
|-----------------------------------|-------------|---|----------------------------|--------------------------------|-----------------------------|
| Age | | Acute Admissions | | | |
| Under 25 | 15 (10.3) | None | 93 (63.7) | 67 (45.9) | $\chi^2_{(2)} = 9.76^*$ |
| 25-39 | 70 (47.9) | Single | 34 (23.3) | 55 (37.7) | |
| 40-54 | 54 (37.0) | Multiple | 19 (13.0) | 24 (16.4) | |
| 55+ | 7 (4.8) | Any Involuntary Admission | 42 (28.8) | 49 (33.6) | $\chi^2_{(1)} = 0.78$ |
| Overall – Mean years (SD) | 37.3 (10.3) | Overall – Number (SD) | 0.57 (0.97) | 0.94 (1.60) | $t = -2.52^\#$ |
| | | Overall – Mean days (SD) | 11.3 (26.1) | 17.9 (29.5) | $t = -2.05^\#$ |
| Gender | | Community Contacts | | | |
| Female | 40 (27.4) | Low (0-6 days) | 60 (41.1) | 34 (23.3) | $\chi^2_{(2)} = 15.85^{**}$ |
| Male | 106 (72.6) | Moderate (7-26 days) | 44 (30.1) | 39 (26.7) | |
| | | High (over 26 days) | 42 (28.8) | 73 (50.0) | |
| Arrival Category ^b | | Overall – Mean days (SD) | 22.0 (35.6) | 32.4 (39.7) | $t = -3.72^{**}$ |
| Community | 36 (24.7) | All Acute/Community Contacts | | | |
| Inpatient/Voluntary | 49 (33.6) | Overall – Mean days (SD) | 33.3 (45.9) | 50.2 (51.1) | $t = -3.79^{**}$ |
| Inpatient/Involuntary | 61 (41.8) | | | | |
| Any discharge diagnosis: | | | | | |
| Schizophrenia or related | 110 (75.3) | | | | |
| Depression/Anxiety or related | 76 (52.1) | | | | |
| Substance use | 59 (40.4) | | | | |
| Bipolar disorder | 22 (15.1) | | | | |
| Other MH related problem | 25 (17.1) | | | | |
| Psychosocial problems | 138 (94.5) | | | | |
| Physical health problems | 129 (88.4) | | | | |

^a 146 index admissions for clients with an ISMHU LOS >7 days.

^b Based on referral source and most restricted legal status at any stage during this admission sequence, including previous unit (if transferred).

^c MH service use per year in the 2 years prior to the index ISMHU admission, with contact days represented as one contact for multiple service contacts on the same day; LOS excludes leave days. Overall χ^2 or paired t-test - significant difference between phases: [#] trend ($p < 0.05$), * $p < 0.01$; ** $p < 0.001$.

Table 2. Profile of interventions received during ISMHU sub-acute inpatient stay (*N* = 146)

| Intervention sub-domains (categories) ^a | Interventions received (%) ^b | Sub-domain | |
|--|---|--------------|--------|
| | | Mean (SD) | Median |
| A. Broad Interventions (6) | | 3.90 (1.31) | 4.00 |
| Community service non MH linkages | 65.1 | | |
| Specialist MH/NGO service linkages | 91.8 | | |
| Vocation, education, training engagement | 61.6 | | |
| Motivational Interviewing/Goal setting | 58.2 | | |
| CBT/Counselling/Therapy | 50.7 | | |
| Recovery Star discussion/other group | 63.0 | | |
| B. Symptoms and Functioning (8) | | 5.37 (1.66) | 6.00 |
| Cognitive assessment/remediation | 19.2 | | |
| Stress management/relaxation | 73.3 | | |
| Healthy lifestyle education | 72.6 | | |
| Medication education | 80.8 | | |
| Daily living education/skills | 91.8 | | |
| Mental Health education | 91.1 | | |
| Budgeting skills | 63.0 | | |
| Self-care, wellbeing skills/education | 45.2 | | |
| C. Self-belief & Social Connection (5) | | 2.62 (1.07) | 3.00 |
| Substance use education/therapy | 41.1 | | |
| Family MH education/connection | 57.5 | | |
| Relapse prevention education/planning | 77.4 | | |
| Social skills/Community access | 77.4 | | |
| Communication/Anger management skills | 8.9 | | |
| Overall (19) | | 11.90 (3.02) | 12.00 |

^a Based on aggregate intervention categories, with the 40 log items regrouped into the 19 intervention types shown here (e.g., 72 clients completed a Healthy Lifestyle group and 81 received an individually tailored Healthy Lifestyle intervention, with 47 completing both; consequently, 106 clients, or 72.6%, received Healthy Lifestyle education); correlation between sub-domains: $r_{A,B} = .332$; $r_{A,C} = .332$; and $r_{B,C} = .246$.

^b Engagement with the intervention program was also categorised as: Low (0-10) 26.0%; Medium (11-13) 44.5%; and High (>13 intervention types) 29.5%.

Table 3. Improvements on the MHRS and HoNOS during the index admission

| Measure (Number of items) | Minimal (N = 37) | | Improved Stage-of-change ^a (N = 59) | | Overall (N = 96) | |
|--|---------------------|---------------------|--|---------------------|---------------------|---------------------|
| | Admission Mean (SD) | Discharge Mean (SD) | Admission Mean (SD) | Discharge Mean (SD) | Admission Mean (SD) | Discharge Mean (SD) |
| MHRS: | | | | | | |
| Symptom management & functioning (4) | 6.18 (1.80) | 6.72 (1.71) | 5.45 (1.10) | 7.39 (1.09) | 5.73 (1.45) | 7.13 (1.39)** |
| Self-belief (4) | 6.81 (1.69) | 7.08 (1.94) | 6.46 (1.39) | 7.92 (1.13) | 6.59 (1.51) | 7.60 (1.54)** |
| Social connection (2) | 6.03 (2.20) | 6.31 (2.52) | 4.77 (1.48) | 7.07 (1.48) | 5.25 (1.88) | 6.78 (1.96)** |
| Overall score (10) | 6.41 (1.64) | 6.79 (1.77) | 5.72 (0.92) | 7.54 (0.96) | 5.98 (1.28) | 7.25 (1.37)** |
| Number of pre-action MHRS domains ^c | 3.27 (2.87) | 3.27 (3.18) | 5.32 (2.05) | 1.08 (1.33) | 4.53 (2.59) | 1.93 (2.46)** |
| Symptom Severity – HoNOS: | | | | | | |
| Overall score (12) | 6.36 (5.22) | 7.77 (6.09) | 11.74 (5.38) | 3.54 (2.95) | 8.66 (5.90) | 5.96 (5.40)** |

^a MHRS (Mental Health Recovery Star, collaboratively completed by clinician/client) ratings were only available for a subset. MHRS improvement from admission to discharge was categorised by the size of the reduction in the number of domains under 6: Minimal Improvement, < 2 domains; Improved stage-of-change, ≥ 2 domains.

^b HoNOS (12 item Health of the Nation Outcome Scale, clinician completed) ratings were only available for a subset; Clinically meaningful improvement from admission to discharge, ≥ 4.

^c Count of MHRS item scores <6;

trend ($p < 0.05$), * $p < 0.01$, ** $p < 0.001$.

Table 4A. Predictors of acute readmission within 2 years post ISMHU index admission ($N = 146$)^a
 – Logistic regression analyses steps 1 and 2

| Characteristics | | Acute admission within 2 years (%) | Unadjusted Odds Ratio (OR) | Adjusted Odds Ratio(AOR) | 99% Confidence Intervals (CI) |
|--------------------------------------|--|------------------------------------|----------------------------|--------------------------|-------------------------------|
| Step 1 | Age | | | | |
| | Under 25 ($N = 15$) | 53.3 | 1.00 | 1.00 | |
| | 25-39 ($N = 70$) | 52.9 | 0.98 | 1.43 | (0.26, 7.69) |
| | 40-54 ($N = 54$) | 38.9 | 0.56 | 0.75 | (0.13, 4.17) |
| | 55+ ($N = 7$) | 28.6 | 0.35 | 0.75 | (0.04, 12.8) |
| | Gender | | | | |
| | Female ($N = 40$) | 55.0 | 1.00 | 1.00 | |
| | Male ($N = 106$) | 43.4 | 0.63 | 0.50 | (0.16, 1.54) |
| | Any diagnosis of: | | | | |
| | Schizophrenia or related ($N = 110$) | 51.8 (vs. 30.6) | 2.44 [#] | 3.00 [#] | (0.89, 10.14) |
| | Depression/anxiety or related ($N = 76$) | 46.1 (vs. 47.1) | 0.96 | 1.19 | (0.45, 3.16) |
| | Substance use ($N = 59$) | 52.5 (vs. 42.5) | 1.50 | 1.68 | (0.59, 4.75) |
| | Bipolar disorder ($N = 22$) | 45.5 (vs. 46.8) | 0.95 | 0.95 | (0.23, 4.02) |
| | Other MH related problem ($N = 25$) | 60.0 (vs. 43.8) | 1.93 | 2.55 | (0.66, 9.88) |
| Acute admissions within 1 year prior | | | | | |
| None ($N = 67$) | 38.8 | 1.00 | 1.00 | | |
| Single ($N = 55$) | 47.3 | 1.41 | 1.42 | (0.51, 3.96) | |
| Multiple ($N = 24$) | 66.7 | 3.15 [*] | 3.14 [#] | (0.79, 12.43) | |
| Step 2 | Community contacts within 1 year prior | | | | |
| | Low (0-6 days) ($N = 34$) | 50.0 | 1.00 | 1.00 | |
| | Moderate (7-26 days) ($N = 39$) | 48.7 | 0.95 | 0.72 | (0.18, 2.92) |
| | High (over 26 days) ($N = 73$) | 43.8 | 0.78 | 0.76 | (0.19, 3.00) |
| | Arrival category | | | | |
| | Community ($N = 36$) | 16.7 | 1.00 | 1.00 | |
| Inpatient/voluntary ($N = 49$) | 51.0 | 5.21 [*] | 7.46 [*] | (1.53, 36.47) | |
| Inpatient/involuntary ($N = 61$) | 60.7 | 7.71 ^{**} | 9.15 ^{**} | (1.90, 44.00) | |

^a Significance tests were based on Wald statistics: [#] trend ($p < 0.05$), ^{*} $p < 0.01$, ^{**} $p < 0.001$; adjusted analyses controlled for all variables at the same or an earlier step.

Table 4B. Predictors of acute readmission within 2 years post ISMHU index admission ($N = 146$)^a
 – Logistic regression analyses steps 3 and 4

| Characteristics | Acute admission within 2 years (%) | Unadjusted Odds Ratio (OR) | Adjusted Odds Ratio (AOR) | 99% Confidence Intervals (CI) |
|--|------------------------------------|----------------------------|---------------------------|-------------------------------|
| Step 3A Engagement with ISMHU program | | | | |
| Low (0-10 interventions) ($N = 38$) | 47.4 | 1.00 | 1.00 | |
| Med (11-13 interventions) ($N = 65$) | 46.2 | 0.95 | 1.03 | (0.28, 3.74) |
| High (>13 interventions) ($N = 43$) | 46.5 | 0.97 | 1.43 | (0.34, 6.03) |
| Step 3B MHRS number of pre-action domains ^b | | | | |
| Two or fewer ($N = 31$) | 41.9 | 1.00 | 1.00 | |
| Three or four ($N = 31$) | 51.6 | 1.48 | 2.33 | (0.43, 12.56) |
| Five or more ($N = 70$) | 45.7 | 1.17 | 1.22 | (0.29, 5.12) |
| Step 3C Symptom severity on admission (HoNOS) ^c | | | | |
| Mild ($N = 65$) | 47.7 | 1.00 | 1.00 | |
| Moderate ($N = 18$) | 38.9 | 0.70 | 0.59 | (0.76, 4.61) |
| Severe ($N = 30$) | 40.0 | 0.73 | 0.90 | (0.21, 3.90) |
| Step 4A MHRS improvement ^b | | | | |
| Minimal (< 2 domains) ($N = 37$) | 43.2 | 1.00 | 1.00 | |
| Improved stage-of-change (≥ 2 domains) ($N = 59$) | 49.2 | 1.27 | 1.11 | (0.25, 4.98) |
| Step 4B HoNOS improvement ^c | | | | |
| Minimal (<4) ($N = 47$) | 53.2 | 1.00 | 1.00 | |
| Clinically meaningful (≥ 4) ($N = 35$) | 40.0 | 0.59 | 0.42 | (0.58, 3.05) |

^a Significance tests were based on Wald statistics: # trend ($p < 0.05$), * $p < 0.01$, ** $p < 0.001$; adjusted analyses controlled for all variables in Table 4A, additionally the Step 4 variables controlled for Step 3A, and either Step 3B (MHRS) or Step 3C (HoNOS).

^b MHRS (Mental Health Recovery Star, collaboratively completed by clinician/client) ratings were only available for a subset and needed to be included in separate analyses. MHRS improvement from admission to discharge was categorised by the size of the reduction in the number of domains under 6: Minimal Improvement, < 2 domains; Improved, ≥ 2 domains.

^c HoNOS (12-item Health of the Nation Outcome Scale, clinician completed) ratings were only available for a subset, and needed to be included in separate analyses; Clinically meaningful stage-of-change improvement from admission to discharge, ≥ 4 .

Table 5. Snapshot of client characteristics and potential benefits from sub-acute stay by arrival category for index ISMHU admission (N = 146).

| Arrival category ^a : | Client characteristics | Potential benefits from sub-acute stay ^b |
|-----------------------------------|---|---|
| Community (N = 36) | <ul style="list-style-type: none"> • Mean age = 37.9 years; 75.0% Male; 63.9% Schizophrenia or related diagnosis • Comparable overall rate of <i>any</i> acute MH admissions within 2 years pre ISMHU to the Inpatient/ Voluntary arrival category (58.3% vs. 55.1%) • Deterioration during 12 months preceding ISMHU: high community MH contacts (3.44 days/mth^c), comprising a 65.9% increase on the previous year | <ul style="list-style-type: none"> • Potential avoidance of an acute MH admission (contiguous with ISMHU stay); and no transfers from ISMHU to acute MH units (vs. 9.1% for other categories) • 75.0% Med/High engagement with ISMHU program • 56.0% improved MHRS stage-of-change • 55.6% clinically meaningful HoNOS improvement • Large reduction in <i>any</i> acute MH admissions during two-year periods pre to post ISMHU (58.3% to 16.7%) • Reduction in community MH contacts during 1-2 years post ISMHU (from 3.65 to 2.32 days/mth) |
| Inpatient/Voluntary (N = 49) | <ul style="list-style-type: none"> • Mean age = 37.8 years; 73.5% Male; 77.6% Schizophrenia or related diagnosis • Deterioration during 12 months preceding ISMHU: mean increase of 12.69 acute MH admission days/yr relative to the previous year, with longer stays by those admitted • Relatively long contiguous voluntary acute admission (mean = 30.65 days) before transfer to ISMHU | <ul style="list-style-type: none"> • 75.5% Med/High engagement with ISMHU program • 61.8% improved MHRS stage-of-change • 15.4% clinically meaningful HoNOS improvement • Small reduction in <i>any</i> acute MH admissions during two-year periods pre to post ISMHU (55.1% to 51.0%) • Small reduction in community MH contacts during 1-2 years post ISMHU (from 3.07 to 2.59 days/mth) |
| Inpatient/Involuntary (N = 61) | <ul style="list-style-type: none"> • Mean age = 36.4 years; 70.5% Male; 80.3% Schizophrenia or related diagnosis • Most (70.5%) experienced an involuntary acute admission during the 2 years pre ISMHU • Deterioration during 12 months preceding ISMHU: increased acute MH admissions and service contacts compared with the previous year, but stable pattern • Long contiguous acute admission with an involuntary component (mean = 57.07 days) before transfer to ISMHU | <ul style="list-style-type: none"> • 72.1% Med/High engagement with ISMHU program • 64.9% improved MHRS stage-of-change • 55.3% clinically meaningful HoNOS improvement • Reduction in <i>any</i> acute MH admissions during two-year periods pre to post ISMHU (80.3% to 60.7%) • Reduction in community MH contacts during 1-2 years post ISMHU (from 3.76 to 2.66 days/mth) |

^a Based on referral source and most restricted legal status at any stage during the relevant admission sequence, including previous unit (if transferred).

^b Med/High engagement with ISMHU program: >10 intervention types (see Table 2); MHRS improved stage-of-change from admission to discharge: ≥ 2 domains (see Table 3); clinically meaningful HoNOS improvement from admission to discharge: ≥ 4 (see Table 3).

^c Days/month (/mth) calculations are based on supplementary Table S2 MH service use rates.

Figure 1. Acute MH Admission days and Community MH Service Contact days per year, within 1-2 years (T1) and 1 year (T2) pre the Index ISMHU admission and within 1 (T4) and 1-2 years (T5) post admission.

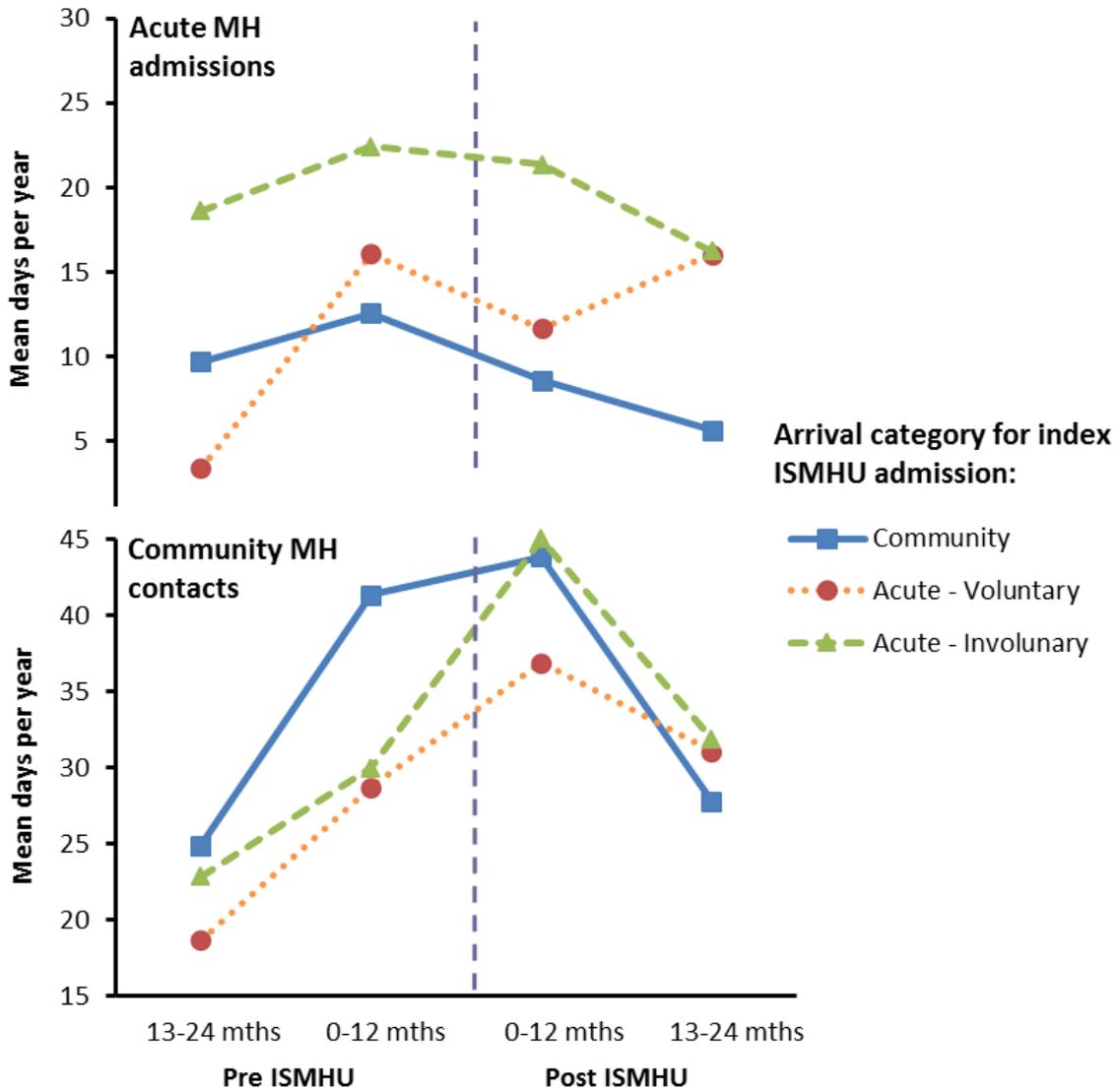


Table S1. Profile of acute voluntary and involuntary MH admissions during the service evaluation period by arrival category for index ISMHU admission: Number and LOS

| Time period associated with acute MH admission: | Arrival category for index ISMHU admission ^a : | | | | | | Overall ^b | |
|---|---|---|--|---|--|---|---|---|
| | Community (N = 36) | | Inpatient/Voluntary (N = 49) | | Inpatient/Involuntary (N = 61) | | Number of acute MH admissions | LOS per admission: Mean (SD) |
| | Number of acute MH admissions | LOS per admission: Mean (SD) | Number of acute MH admissions | LOS per admission: Mean (SD) | Number of acute MH admissions | LOS per admission: Mean (SD) | | |
| T1 1-2 years pre index ISMHU admission | Vol: 7 [6] Invol: 9 [8] Total: 16 [13] | 11.57 (12.20) 29.78 (26.45) 21.81 (22.80) | Vol: 4 [3] Invol: 10 [6] Total: 14 [8] | 6.50 (4.65) 14.00 (8.89) 11.86 (8.49) | Vol: 14 [12] Invol: 39 [28] Total: 53 [32] | 6.93 (8.48) 26.62 (34.98) 21.42 (31.45) | Vol: 25 [21] Invol: 58 [42] Total: 83 [53] | 8.16 (9.15) 24.93 (30.87) 19.88 (27.33) |
| T2 Within 1 year pre index ISMHU admission | Vol: 17 [13] Invol: 8 [5] Total: 25 [17] | 16.94 (16.56) 20.63 (19.32) 18.12 (17.17) | Vol: 15 [12] Invol: 21 [16] Total: 36 [25] | 16.13 (13.87) 26.00 (42.94) 21.89 (33.99) | Vol: 25 [19] Invol: 51 [28] Total: 76 [37] | 8.28 (9.24) 22.78 (23.16) 18.01 (20.78) | Vol: 57 [44] Invol: 80 [49] Total: 137 [79] | 12.93 (13.43) 23.41 (29.02) 19.05 (24.30) |
| T3 Adjoining index ISMHU admission | - | - | Vol: 49 | 30.65 (27.11) | Invol: 61 | 57.07 (39.61) | Vol: 49 Invol: 61 Total: 109 | 30.65 (27.11) 57.07 (39.61) 45.19 (36.85) |
| T4 Within 1 year post index ISMHU admission | Vol: 2 [2] Invol: 2 [2] Total: 4 [3] | 1.00 (0.00) 153.50 (99.70) 77.25 (105.2) | Vol: 9 [8] Invol: 12 [8] Total: 21 [14] | 16.11 (23.40) 36.50 (35.50) 27.19 (31.76) | Vol: 32 [19] Invol: 29 [18] Total: 61 [27] | 10.38 (15.40) 33.45 (37.51) 21.34 (30.23) | Vol: 43 [29] Invol: 43 [28] Total: 86 [44] | 11.14 (17.03) 39.60 (46.41) 25.37 (37.58) |
| T5 1-2 years post index ISMHU admission | Vol: 2 [2] Invol: 3 [3] Total: 5 [5] | 36.50 (27.58) 43.33 (33.01) 40.60 (27.36) | Vol: 11 [9] Invol: 12 [9] Total: 23 [16] | 15.09 (16.77) 51.67 (61.79) 34.17 (48.84) | Vol: 12 [8] Invol: 22 [16] Total: 34 [19] | 27.25 (30.90) 30.24 (42.09) 29.19 (38.05) | Vol: 25 [19] Invol: 37 [28] Total: 62 [40] | 22.64 (25.28) 38.25 (48.60) 31.96 (41.29) |

^a Based on referral source and most restricted legal status at any stage during the relevant admission sequence, including previous unit (if transferred).

Vol: voluntary admission; Invol: involuntary admission. A breakdown of the number of acute MH admissions during each time period (Vol, Invol and Total) is presented, together with the associated mean length of stay (LOS, in days) per admission - excluding non-admitted persons and leave days. Values in square brackets indicate the number of unique individuals. ^b For comparative purposes, the average LOS for specialised (admitted patient) mental health care in NSW public acute hospitals was 18.4 days in 2011-12 (Australian Institute of Health and Welfare, 2013. *Australian hospital statistics 2011-12*: Health Services Series No. 50. Cat. No. HSE 134. Canberra: AIHW).

Table S2. MH service use per year during the service evaluation period by arrival category for index ISMHU admission (N = 146).

| Time period: | MH service use index | Arrival category for index ISMHU admission ^a : | | | | | |
|--|------------------------------|---|---------|---------------------------------|---------|-----------------------------------|---------|
| | | Community (N = 36) | | Inpatient/Voluntary (N = 49) | | Inpatient/Involuntary (N = 61) | |
| | | Mean | (SD) | Mean | (SD) | Mean | (SD) |
| T1 1-2 years pre index ISMHU admission | Acute MH admissions – Number | 0.44 | (0.65) | 0.29 | (0.94) | 0.87 | (1.09) |
| | – Days | 9.69 | (19.90) | 3.39 | (9.32) | 18.61 | (35.13) |
| | Community contacts – Days | 24.92 | (48.50) | 18.71 | (28.01) | 22.89 | (32.44) |
| | Combined – Days | 34.61 | (52.36) | 22.10 | (31.48) | 41.49 | (50.35) |
| T2 Within 1 year pre index ISMHU admission | Acute MH admissions – Number | 0.69 | (0.89) | 0.73 | (1.02) | 1.25 | (2.18) |
| | – Days | 12.58 | (19.47) | 16.08 | (33.73) | 22.44 | (30.53) |
| | Community contacts – Days | 41.33 | (45.83) | 28.71 | (37.51) | 30.00 | (37.38) |
| | Combined – Days | 53.92 | (48.00) | 44.80 | (55.91) | 52.44 | (49.18) |
| T4 Within 1 year post index ISMHU admission | Acute MH admissions – Number | 0.11 | (0.40) | 0.43 | (0.87) | 1.00 | (1.82) |
| | – Days | 8.58 | (39.49) | 11.65 | (31.68) | 21.34 | (37.19) |
| | Community contacts – Days | 43.83 | (40.96) | 36.88 | (38.26) | 45.11 | (29.64) |
| | Combined – Days | 52.42 | (54.66) | 48.53 | (54.58) | 66.46 | (47.71) |
| T5 1-2 years post index ISMHU admission | Acute MH admissions – Number | 0.14 | (0.35) | 0.47 | (0.82) | 0.56 | (1.07) |
| | – Days | 5.64 | (16.98) | 16.04 | (41.07) | 16.27 | (41.91) |
| | Community contacts – Days | 27.81 | (37.31) | 31.10 | (48.25) | 31.92 | (28.59) |
| | Combined – Days | 33.44 | (40.36) | 47.14 | (65.24) | 48.19 | (54.49) |

^a Based on referral source and most restricted legal status at any stage during the relevant admission sequence, including previous unit (if transferred).

Aggregate acute MH admissions (Number, Days), community contact days, and combined service contact days per person/yr were calculated; the reported means (SDs) include non-admitted persons and those with no community contacts.

For each service use index, separate repeated measures ANOVAs were conducted for the pre and post index ISMHU admission time periods – that is, Arrival Category by T1 vs. T2, and Arrival Category by T4 vs. T5. For the pre ISMHU period: the Involuntary subgroup tended to have significantly higher levels of acute MH admissions (Number, Days) than the other subgroups; T2 values tended to be significantly higher than T1; and there were no differential changes by Arrival Category. For the post ISMHU period: the Involuntary subgroup had significantly higher levels of acute MH admissions (Number, Days) compared to the Community subgroup; T4 community contact days and combined days were significantly higher than T5; and there were no differential changes by Arrival Category.

Table S3. Any acute MH admissions during selected service evaluation periods by arrival category for index ISMHU admission ($N = 146$).

| Time period: | Acute MH admissions during 2 year period | Arrival category for index ISMHU admission ^a : | | | Statistical comparison |
|---|--|---|---|---|-----------------------------|
| | | Community ($N = 36$) | Inpatient/ Voluntary ($N = 49$) | Inpatient/ Involuntary ($N = 61$) | |
| | | N (%) | N (%) | N (%) | |
| T1-2 Within 2 years pre index ISMHU admission | Any Voluntary | 15 (41.7) | 15 (30.6) | 23 (37.7) | $\chi^2_{(2)} = 1.19$ |
| | Any Involuntary | 11 (30.6) | 17 (34.7) | 43 (70.5) | $\chi^2_{(2)} = 20.19^{**}$ |
| | Any MH admission | 21 (58.3) | 27 (55.1) | 49 (80.3) | $\chi^2_{(2)} = 9.16^*$ |
| T4-5 Within 2 years post index ISMHU admission | Any Voluntary | 3 (8.3) | 14 (28.6) | 23 (37.7) | $\chi^2_{(2)} = 9.87^*$ |
| | Any Involuntary | 4 (11.1) | 14 (28.6) | 28 (45.9) | $\chi^2_{(2)} = 12.99^*$ |
| | Any MH admission | 6 (16.7) | 25 (51.0) | 37 (60.7) | $\chi^2_{(2)} = 18.19^{**}$ |

^aBased on referral source and most restricted legal status at any stage during the relevant admission sequence, including previous unit (if transferred). Any evidence of acute MH admissions (Voluntary, Involuntary, Either) during the 2 years pre and the 2 years post the index ISMHU admission. Overall statistical comparison (χ^2): # trend ($p < 0.05$), * $p < 0.01$; ** $p < 0.001$.