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Table DS1 Quantitative studies on the impact of ward design on treatment outcomes and well-being for patients and staff

Author	Title	Study design	Participants	Main findings
Higgs, 1970[13]	Effects of gross environmental change upon behaviour of schizophrenics: a cautionary note	Pre-post observational/survey study with control group	68 experimental group 125 control group	Observations and Brief Psychiatric Rating Scale scores demonstrated an improvement in the experimental group
Beauchemin & Hays, 1996[14]	Sunny hospital rooms expedite recovery from severe and refractory depressions	Audit of length of stay days (sunny *v.* dull rooms)	174 patients with severe depression	2.6 days shorter length of stay for those in sunny rooms
Benedetti *et al*, 2001[15]	Morning sunlight reduces the length of hospitalisation in bipolar depression	Audit of length of stay days (east *v.* west rooms)	602 patients with bipolar or unipolar affective disorder	3.7 days shorter length of stay in those with bipolar depression in east-facing room, no difference for those with unipolar depression
Holahan, 1972[16]	Seating patterns and patient behaviour in an experimental dayroom	Observational study of groups of patients randomly assigned to four distinct furniture arrangements in day room	120 patients	Greater social interaction observed in sociopetal and mixed arrangements compared with sociofugal and free (patient chosen) arrangements
Holahan & Saegert, 1973[17]	Behavioural and attitudinal effect of large scale variation in the physical environment of psychiatric wards	Observational randomised controlled trial	25 patients in each group	Patients' perceptions improved and spent more time engaged in social activity on remodelled ward than control ward
Ittelson *et al*, 1970[18]	Bedroom size and social interaction of the psychiatric ward	Observational study	Female patients, number unknown	More social activity was observed in single or double room than dormitory rooms
Whitehead *et al*, 1984[19]	Objective and subjective evaluation of psychiatric ward redesign	Observational study and survey before and after ward redesign	Patients and staff in a 30-bed ward, number unknown	Increased social interaction in redesigned ward, positive responses to ward changes by patients
Devlin, 1992[20]	Psychiatric ward renovation: staff perception and patient behaviour	Pre-/post-observational survey study	82 patients 83 staff	Positive changes in patient and staff behaviour – significant decrease in patient stereotypy
Wykes, 1982[21]	A hostel ward for 'new' long stay patients: an evaluative study of 'a ward in a house'	Observational/survey study with control group	13 patients in ward in a house 12 patients in hospital -based ward	Time spent doing nothing or watching TV was greater in the hospital-based ward, whereas occupational and social activities were more frequent in the ward in a house
McGonagle & Allan, 2002[22]	A comparison of behaviour in two differing psychiatric long-stay rehabilitation environments	Assessment of patients in rehabilitation ward, hospital bungalow and community units with Social Behaviour Schedule and Social Functioning Questionnaire	37 hospital ward residents 18 bungalow residents 11 community unit residents	Social Behaviour Schedule ratings lower for bungalow residents compared with ward residents. Both groups show comparable ratings on Social Functioning Questionnaire so no evidence of selection bias
Edwards & Hults, 1970[23]	'Open' nursing stations on psychiatric wards	Time study/survey/interviews on two identical wards at two time points, with open nursing station and control ward	80 male patients 26 staff	Staff spent more time interacting in ward, whereas patients spent less time near the nursing station in the experimental compared with the control ward
Tyson *et al*, 2002[24]	The impact of ward design on the behaviour, occupational satisfaction and well-being on psychiatric nurses	Pre-/post-observational survey study with Maslach Burnout Inventory and interviews	80 staff	Increased socialising between staff and patients, but no difference in staff burnout. Staff perceived improved patient privacy as stressful for staff
Baldwin, 1985[25]	Effects of furniture re-arrangement on the atmosphere of wards in a maximum security hospital	Observational study, survey and pre–post two time-limited interventions	7 intervention and 3 control wards (20 patients and 6 staff per ward)	Some improvement in social interaction, non-significant decrease in violence and seclusion rates, improved perception of wards. Causal relationship not established
Christenfeld *et al*, 1989[26]	How physical settings affect chronic mental patients	Pre-/post-ward redesign survey study with control group	Staff: 27 experimental group, 44 control group Patients: 37 experimental group, 44 control group	Improved perceptions from both staff and patients in the group moved to the redesigned ward. 50% violence reduction, no changes in Ward Atmosphere Scale

(continued)

Table DS1 Quantitative studies on the impact of ward design on treatment outcomes and well-being for patients and staff (*continued*)

Author	Title	Study design	Participants	Main findings
Vaaler *et al*, 2005[27]	Effects of different interior decorations in the seclusion area of a psychiatric ward	Pre–post observational/survey study with control group	27 experimental group 27 control group	Violence and vandalism were significantly reduced on the redesigned seclusion area of a ward. No change in Positive and Negative Syndrome Scale assessed symptoms
van der Schaaf *et al*, 2013[28]	Impact of the physical environment of psychiatric wards on the use of seclusion	Multilevel regression analysis correlating design features of wards and episodes of seclusion	Data from 199 wards and 14 834 patients	Specific design features either increase the risk of seclusion (presence of garden, safety features) or decrease it (private spaces, higher level of comfort, visibility)
Corey *et al*, 1986[29]	Psychiatric ward atmosphere: a before and after look at how refurbishing affects staff and patient perceptions of the psychosocial environment	Pre- and post-intervention assessment of ward atmosphere (Ward Atmosphere Scale) on three wards	3 intervention wards Staff: 65/56 test/retest Patients: 66/60 test/retest	Some improvement in Ward Atmosphere Scale scoring, particularly in acute psychiatric ward and in Involvement, Order and Organisation subscales
Southard *et al*, 2012[30]	Enclosed versus open nursing stations in adult acute care psychiatric settings	Cross-sectional, pre–post study	81 patients 25 nursing staff	No increase in aggression after nursing station opening, no significant change in patient and staff perceptions of therapeutic milieu
Urbanoski *et al*, 2013[31]	Does the redesign of a psychiatric inpatient unit change the treatment process and outcomes?	Pre- and post-intervention assessment of perceptions of ward (Ward Atmosphere Scale, Client Satisfaction Questionnaire-8) and of functioning (Global Assessment of Functioning)	290 patients in one ward (16-bed before redesign and 24-bed after redesign)	More positive atmosphere and greater treatment satisfaction post-renovation. Negative association between renovation and Global Assessment of Functioning improvement.
Sheehan *et al*, 2013[32]	Evaluating the built environment in inpatient psychiatric wards	Multilevel modelling of relationship between ward design characteristics and staff satisfaction	98 wards 1540 staff	Non-corridor design and en-suite bedrooms associated with staff satisfaction. No significant effect for ease of observation, safety features and modern furnishings

Table DS2 Qualitative studies on patient and staff perceptions of ward design

Author	Title	Study design	Participants	Main findings
Novotna *et al*, 2011[33]	Client-centred design of residential addiction and mental health care facilities: staff perceptions of their work environment	Pre-/post-occupancy behavioural mapping and focus groups	17 staff members	Changes which had a positive impact on patients, had negative impact on staff (increased patient privacy, more open spaces)
Curtis *et al*, 2007[34]	Therapeutic landscapes in hospital design: a qualitative assessment by staff and service users of the design of a new mental health unit	Focus group/interviews of staff and patients discussing a newly built ward, qualitative	10 nurses 3 psychiatrists 7 patients	Symbolic aspects of space important to staff and patients. Respondents felt that combination of design elements more significant for well-being than elements in isolation
Wood *et al*, 2012[35]	Creating 'therapeutic landscapes' for mental health carers in inpatient settings: a dynamic perspective on permeability and inclusivity	Interviews/focus groups of carers, patients and staff on a newly built ward, qualitative	9 carers 1 nurse 1 patient	Addressing social as well as physical needs of both carers and patients through ward design is important for promotion of well-being