Table 2: Studies of health service delivery changes

First Author	Year	Country	Population Studied	Intervention	Screening			Method(s) applied	Results	Main study weaknesses
					Type of screening (targeted or with multiple parameters)	When, how and where in the care pathway was screening offered	Screening health professional(s) and type of service			
Abdallah et al[40]	2016	UK	95 service users with schizophrenia living in care homes	Patient education and education of care home staff	Physical health monitoring (blood workup, liver function test, urea and Electrolytes, full blood count, fasting blood glucose, blood lipid, HbA1c, prolactin, blood pressure/pulse/weight measurem	Physical health screening was offered during the Care Programme Approach review (held every six months to one year)	Screening was done by GPs. Patients were attached to the Haringey Community Rehabilitation team (multidisciplinary care coordination team that includes mental health nurses, social	Quality Improvement	Improvement in culture within care home where staff and service users actively participated in physical health monitoring Blood pressure and weight measured in 68% of patients compared to 10% and 0 at baseline 55% of patients had pulse measured compared to 0 at baseline	No randomization, no control group Small sample, difficult to determine results as in later PDSA cycles the interventions did not target only the patient group included in the results

					ent, BMI, waist circumference)		workers, psychiatrists, psychologists, and mental health care assistants)		68% had bloods done compared to 0 at baseline	
Druss et al[44]	2010	USA	407 service users with SMI under care of community teams	Participants with SMI at an urban community mental health centre were randomly assigned to either the medical care management intervention or usual care For individuals in the intervention group, care	23 indicators drawn from the U.S. Preventive Services Task Force guidelines were included across the following four domains: 1) physical examination (blood pressure, eye, height/weight, oral, breast, mammogram, and pelvic)	Care managers supported patients to get screened by providing communication and advocacy with medical providers, health education, and support in overcoming system-level fragmentation and barriers to primary	Care managers (registered nurses) assisted patients from an urban community mental health centre in Atlanta to access primary care services	Randomized Control Trial	12-month follow-up evaluation: intervention group received average 58.7% of recommended preventive services compared with 21.8% in usual care Significantly higher proportion of evidence-based services for cardio-metabolic conditions (34.9% versus 27.7%) Higher likelihood to	Low risk of bias (Performance bias as control group - treatment as usual - not blinded) Broad entry criteria limited the statistical power to examine outcomes for individual medical conditions Study was conducted in a single site so replication would be needed to fully assess generalizability to different types of community

				managers provided communication and advocacy with medical providers, health education, and support in overcoming system-level fragmentation and barriers to primary medical care	2) screening tests (cholesterol, fecal blood, HIV, sigmoid, and tuberculosis) 3) vaccinations (influenza, hepatitis B, measles, mumps, and rubella, pneumococcal bacterial infection, tetanus-diphtheria, and varicella) 4) education (exercise, self-examination, smoking,	medical care			have primary care provider (71.2% versus 51.9%) Intervention group showed significant improvement on SF-36 mental component summary (8.0% [versus a 1.1% decline in the usual care group]) Scores on Framingham Cardiovascular Risk Index significantly better in intervention group (6.9%) than usual care group (9.8%)	mental health settings

					nutrition, and weight)					
Hardy & Gray[26]	2012	UK	92 community service users with severe and enduring mental illness 338 service users with diabetes	Retrospective comparison of response rate of patients with SMI and diabetes to an invitation appointment letter to attend a primary care health check Patients with SMI sent an appointment at a predetermined time and date. Annual health check for	HIP for primary care: review of any pre-existing co-morbid physical health problems, screening for emergent diabetes, hypertension and dyslipidaemia, initiation of appropriate treatment for newly diagnosed conditions, providing information about co-	Patients with SMI were sent an appointment letter 10 days before the appointment inviting them to attend a primary care health check with a predetermined date and time	Practice nurses in primary care	Retrospective audit	66% service users with SMI attended appointment 81% service users with diabetes attended appointment Service users with diabetes 2.2 more likely to attend health check	No randomization, no control group Unclear if sample reflects whole population of SMI (or diabetes)

				patients with SMI followed the HIP guidance	occurring physical health problems, lifestyle advice (diet, exercise, smoking, alcohol, sex and guidance about self-examination (breast, testicles)), prompt that eyes and teeth have been tested/ checked; review of psychotropic medication and side effect check.					

Heyding et al[29]	2005	Canada	Disadvantaged women aged 50-70 who attended inner-city drop-in centre (N = 158 in 1995-2001 and N = 89 in 2002)	Drop-in centre and nearby hospital in Toronto initiated collaborative breast cancer screening project in which staff of drop-in centre accompanied small groups of women for mammography visits at weekly pre-arranged time	Screening mammography	A staff member of the drop-in centre accompanied small groups of women aged 50-70 for mammography visits at a weekly pre-arranged time	Staff member of an inner-city drop-in centre in Toronto accompanied small groups of women to St. Michael's hospital women's health care centre for mammography screening. A family physician working at the drop-in centre served as the referring physician requesting the mammogram	Pre-post audit Comparison between screening before and after intervention year	Increase from average of 4.7% women receiving a mammography to 29.2%	No randomization, no control group Observational rather than experimental design Limited control over extraneous variables Audited documentation may have been inaccurate or incomplete

Latoo et al[41]	2015	UK	52-55 service users receiving antipsychotics in Early intervention in Psychosis service	Advancing Quality Alliance design to examine six physical health parameters: weight, height, BMI, BP, blood glucose and serum lipids	Comprehensive physical assessment (serum lipid profile, blood glucose, body weight, height, BMI and blood pressure). Other information was collected such as smoking, diet, exercise, sexual health, sleep, dental and optical health, ECGs and other routine blood checks	Notification list alerted on the computer when screening was due. Access to blood tests for both localities was established to help facilitate prompt access to blood results. Wellbeing nurse-led clinics were held in Halton and a social worker- led physical health clinic was initiated in Warrington	Patients were recruited from the Warrington and Halton Early Intervention in Psychosis Service. Screening took place in primary care and physical health clinics (wellbeing nurse-led clinics in Halton and a social worker- led physical health clinic in Warrington)	Retrospective review of clinical records following improvement in physical health monitoring	Screening and monitoring of six parameters: At 4 weeks 29 patients recorded screening, 19 (66%) of which had six types of screening At 24 months, out of 16 patients who had their screening recorded, 15 (95%) had 6 types of screening	No control group No randomized design to test new screening and assessment method

Millar[31]	2010	UK	152 community based service users 100 inpatient and community service users all prescribed antipsychotic medication	Dundee Health Screening Clinic developed to address needs of this population by monitoring physical health and providing follow-up to ensure that patients received necessary care	The Health Screening Clinic included three main types of clinical investigations: 1) physical examination, ECG, and blood screening 2) rating scales with medical/ drug histories and 3) diet and lifestyle advice	MS audit of 152 community-based patients to quantify their physical health problems. A database was set up to record the measurements completed within the Clinic. Results were collected and appropriate follow-up was organised through primary care or specialist services.	Staff at the Dundee Health Screening Clinic (community setting with a multidisciplinary team drawn from the Community Mental Health Team and day hospital staff). Nursing staff were trained in blood letting, measuring blood pressure and waist circumference and completing ECGs.	Mixed Methods: pilot study, audit and satisfaction survey	Heavy burden of physical health problems identified in Phase One (66% obesity, 60% elevated cholesterol, 32% hypertension) Of the first 100 patients audited: 33% had MS 99% agreed health screening important 65% reported lifestyle change	No randomization, no control group Generalizability may be limited due to differences in availability of resources in different areas, though no additional resources were used to develop the intervention

Osborn et al[45]	2010	UK	121 service users under the care of a community mental health team	Nurse-led screening programme and education pack regarding appropriate screening for cardiovascular disease (CVD) related risk factors	CVD screening (including smoking, blood pressure, random blood glucose and lipids)	The intervention established a system to monitor whether CVD screening had occurred for CMHT patients and sent prompts to primary and secondary care staff if screening had not occurred. The nurse offered screening to cover patients who still had not received the complete	Within the intervention arm, approximately half the screening was performed in general practice and half by the trial registered general nurse with previous experience of providing cardiovascular screening	Cluster Randomized Feasibility trial	After the trial CVD screening increased in both arms but participants from intervention arm were significantly more likely to have received screening for blood pressure (96% vs 68%), cholesterol (66.7% vs 26.9%), glucose (66.7% vs 36.5%), BMI (92.5% vs 65.2%), smoking status (88.2% vs 57.8%) and have 10 year CVD risk score calculated (38.2% vs 10.9%)	Low risk of bias Response rate in the recruitment for outcome data was main limitation Recruitment was time limited because of funding Participants who provided outcome data may have been a biased sample of CMHT patients therefore generalization of results is difficult

						battery of CVD screening				
Rosenbaum et al[46]	2014	Australia	60 service users on inpatient psychiatric ward 25 mental health nurses	Educational training including waist circumference (WC) measurement Change in assessment-form design	WC measurement	Over a nine month period, file-based reminder for nurse-assessed WC measurement of mental health inpatients within a private psychiatric facility	Mental health nurses working in a private psychiatric hospital in Sydney	Pre-post audit of the frequency of WC Documentation before/after intervention	Improved measurement by nurses of WC from 0-58% WC was higher in these patients than general population 19% had BMI within a healthy range, 37% smoked, 31% were hypertensive	No randomization, no control group Not all staff were able to receive intervention
Thompson et al[43]	2011	Australia	118 files of service users on antipsychotics under the care of Early Psychosis and Prevention Centre service	Educational intervention for staff Development of local guidelines, provision of	Weight and metabolic monitoring (height and weight to estimate BMI, systolic and diastolic blood pressure, waist and hip	Equipment required to undertake monitoring (e.g. scales, tape measures, blood pressure cuffs) was located in each	Psychiatrists working in an Early Psychosis Prevention and Intervention Centre in Melbourne	Pre-post audit of completion of metabolic screens	Improvements in screening and monitoring of four metabolic indices at the post-intervention time point Individual rates were higher for screening (74.4% to	No randomization, no control group Naturalistic setting

				monitoring equipment, prompts in patients' records and regular reviews	circumference (to obtain waist-hip ratio), fasting blood glucose, full fasting blood lipid profile (including total cholesterol, low and high density lipoprotein and triglycerides), number of cigarettes smoked daily and level of daily exercise	psychiatrist ' s room. Stamps that indicated the necessary blood tests for monitoring were placed in the psychiatrist s ' rooms to aid ordering and completion of the correct blood investigations. Metabolic screening within 6 months of being prescribed an antipsychotic and			84.9%) than monitoring outcomes (24.4% to 41.6%) Rates ranged between 17.4% for blood lipids to 34.9% for obesity measures	

						metabolic monitoring between 1 and 6 months following initiation of antipsychotic medication. Regular review of a patient's metabolic status was built into the clinical review process which occurs on a 3-month basis for all patients				
Vasudev & Martindale[42]	2010	UK	66-72 service users aged 14 to 35 under care of Early Intervention service	In-house training for members of the Early Intervention Service	Annual physical health check (weight, blood pressure, blood	Mental health clinicians address physical health with patients during	Patients in Early Interventions in Psychosis service in Sunderland were	Pre-post audit	Number of patients having at least one annual physical health check increased from 20% to 58%	No randomization, no control group Focuses on Early Intervention so many people do not have a formal

			for more than a month	Interventions between audit – in-house training, physical health mandatory component on care plan review, joint responsibility for communicating with GP, referral information updated to include physical health, liaison with wider MDT	sugar, lipids, electrocardiogram (only done if patient at high risk due to young patient age), full blood count, urea and serum electrolytes, liver function tests and prolactin)	clinical practice and letters are sent annually to GPs to remind them to conduct the physical health checks (study audited this process)	recruited; screening takes place in primary care		Patients who had undergone physical health check at re-audit, a record of some/all of the checks was available in the notes for 75% of patients	diagnosis of SMI e.g. schizophrenia Only 7 months between audits, therefore very short time to measure long term impact

Wilson et al[48]	2014	Australia	107 to 232 service users attending clozapine clinic	Six education sessions covering test interpretation, MS, diabetes management, obesity, smoking cessation and lifestyle interventions "Let's Get Physical" initiative – designation of two months annually as physical health months (PHM) during which time	Metabolic monitoring (including fasting blood glucose, lipids, BMI, girth)	Metabolic monitoring occurs in May and November (designed as 'physical health months'). In the months preceding May and November, investigation order forms were attached to charts for provision by administrators, written information about investigations was provided to patients during consultations, and necessary	Patients on clozapine and staff at Metro North Mental Health – Royal Brisbane and Women's Hospital, which provides assessment and specialist services to a socio-economically diverse population in Brisbane	Quality Improvement Mixed Methods	Completion rates of metabolic monitoring: 69.2% at first month and 65.1% at second month Limited evidence of actions post results	No randomization, no control group Limited possibility of generalization due to single site and very specific population

				revised service protocol required metabolic monitoring for all eligible patients Service protocols were revised to require metabolic monitoring of all eligible patients during PHMs		equipment was placed in consulting rooms. In May and November, a proforma for recording test results and lifestyle assessments (smoking, exercise, alcohol intake) were attached to charts, and clinic appointments were extended from 20 to 30 minutes				

Xiong et al[30]	2015	USA	Patients were receiving outpatient mental health treatment at four mental health clinics in California	Comparison of preventive services used in an integrated behavioural health primary care clinic with two existing community mental health programmes	Cancer services included the following tests/procedures: mammogram, Papanicolaou test, prostate specific antigen test, digital rectal exam, fecal occult blood test, and flexible sigmoidoscopy or colonoscopy. Metabolic profile included blood pressure, height and weight, cholesterol, and blood	Psychiatrists made referrals to primary care doctors for screening in routine clinical practice	Screening was undertaken by various clinical staff and took place in primary care (via referral from two community mental health clinics) and in an Integrated Behavioral Health Primary Care programme housed in the Sacramento County Primary Care Clinic with access to on-site laboratory and x-ray services	Cross-sectional study comparing use of preventative services 350 surveys	Patients on antipsychotic medication were less likely to use preventive non-cancer services than their comparison group ($p = 0.04$) Integrated Behavioral Health Primary Care unit associated with higher overall service utilization than a community mental health team ($p < 0.001$)	No randomization, no control group Unable to adjust for confounding factors such as severity of illness

					sugar for diabetes. Infection preventive services included influenza immunization, Hepatitis C Virus and Human Immunodeficiency Virus tests					