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Improving general medical care for persons with mental and addictive disorders: systematic review☆

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Abstract

Objective: To conduct a systematic review of studies of interventions designed to improve general medical care in persons with mental and addictive disorders.
Methods: Following Cochrane Collaboration guidelines, a comprehensive search through October 2005 was conducted in multiple bibliometric indexes using search terms related to primary medical care and mental health/addictive disorders. Two assessors independently extracted information on linkage, quality, outcomes and costs of care.
Results: Six randomized trials met the preestablished search criteria. The interventions spanned a continuum of approaches for improving treatment, ranging from on-site medical consultation, through team-based approaches, to models involving facilitated referrals to primary care. The studies demonstrated a substantial positive impact on linkage to and quality of medical care; there was evidence of health improvement and improved abstinence rates in patients with greater medical comorbidity. The three studies that assessed expenditures found the programs to be cost-neutral from a health-plan perspective.
Conclusion: A small but growing body of research suggests that a range of models may hold potential for improving these patients' health and health care, at a relatively modest cost. Future work should continue to develop and test approaches to this problem that can be tailored to local system needs and capacities.

Keywords: Primary care; Health improvement

1. Introduction

An extensive literature has documented that individuals with mental and addictive disorders are at elevated risk for a wide range of medical comorbid conditions [1–9] and premature mortality [10–20]. It has been estimated that life expectancy is reduced 6.3 years among persons with depression, 7.2 years for schizophrenia and 13.8 years for individuals with a substance use disorder [21].

What is the cause of this excess morbidity and mortality? The pathways are likely complex and multifactorial [22]; contributing risk factors include toxic effects of substances [7,23], iatrogenic effects of medications [24–26], neurohumoral dysregulation [25,27–29] and behavioral risk factors such as inactivity and smoking [30–36].

There is increasing evidence that these problems may also be accompanied by an added risk, poor quality of general medical care [37–43]. Elevated rates of poverty, unemployment and uninsurance may hinder these individuals' access to basic medical services [44–46]. Even when these patients are enrolled in primary care, they are at risk for poor compliance with prescribed treatments [47,48]. General medical providers are often not comfortable in caring for these patients, regarding them as difficult and time-consuming to treat [49,50]. Finally, the geographic, financial and ideological separation between the general medical and specialty behavioral systems present a range of challenges to coordinating care across the boundaries that divide them [51–54]. Poor quality of medical care may explain a substantial portion of these patients' excess mortality [55].

The combination of high medical need combined with poor quality of medical care is the hallmark of medically vulnerable populations, groups for whom the gap between health needs and available services is greatest [56]. Primary

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medical care has been shown to be particularly important for, and efficacious in, improving health in populations who have problems in obtaining appropriate services due to demographic, geographic or economic barriers [57,58].

To what extent can interventions targeted at improving care for persons with behavioral disorders produce similar benefits? This article seeks to address this question by systematically reviewing the studies of these interventions and their association with primary care linkage, quality, outcomes and costs.

2. Methods

2.1. Search strategy

An a priori search strategy was developed to identify all studies examining interventions to improve quality of primary medical care in persons with addictive (alcohol and illicit substance use) and/or mental conditions. We included both addictive and mental disorders given their high rates of co-occurrence, the fact that that both are associated with increased morbidity and mortality, and the fact that both are commonly treated in settings that are separated from general medical care.

A comprehensive search without language restriction from inception through June 2005 was conducted within MEDLINE, EMBASE, CINAHL, PsycINFO, Social Sciences Abstracts and the Cochrane Library to identify all reports of interventions designed to improve quality of medical care in persons with addictive and/or mental conditions.

The search followed Cochrane guidelines from the Cochrane Effective Practice and Organization of Care Group (EPOC), the Cochrane Collaborative Review Group that focuses on organizational interventions [59]. This approach includes randomized and controlled clinical trials, controlled before-and-after studies and interrupted time series designs. EPOC staff provided us with a search filter for identifying the studies from the MEDLINE database based on our specifications.

Searches included the following terms: *mental disorders*; *substance-related disorders*; *substance abuse treatment centers*; *community mental health centers*; *schizophrenia*; *bipolar disorder*; *depressive disorder*; *depression*; *alcoholism*; *opioid-related disorders*; *cocaine-related disorders*; *primary health care*; *preventive health services*; *ambulatory care*; and *total quality management*.

To be included in the final sample, interventions needed to explicitly address the goal of improving subjects' medical care. Thus, we did not include studies seeking to study the impact of improved depression care on medical outcomes such as diabetes [60,61] and coronary artery disease [62,63].

2.2. Data extraction, assessment of study quality and data synthesis

Two assessors (B.G.D. and S.v.E.) independently screened all citations, index terms, abstracts if available and the full text for all articles considered potentially relevant. Bibliographies were scanned for other potentially relevant studies, and authors were contacted. By using a standardized abstraction form, assessors entered information on study design, population characteristics, sample size and intervention strategies from articles that met the inclusion criteria. Multiple published reports from a single study were treated as a single data point.

Reviewers extracted each of the following measures (where available): (1) linkage with primary care (defined as one or more visit with a general medical provider); (2) quality of primary care (medical care delivery consistent with evidence-based guidelines); (3) medical outcomes (change in health status and/or mortality); (4) mental health and addictive outcomes (abstinence or symptom measures); (5) total costs from the perspective of the health system.

The quality of randomized trials was assessed and recorded using a standard instrument that assesses appropriateness of randomization, handling of withdrawals and dropouts, and adequacy of blinding [64]. Because eligible studies varied in clinical settings, disorders and in outcome measures, a narrative synthesis was deemed more appropriate than formal meta-analysis. Wherever sufficient data were available within the manuscript or through contacting the authors, we constructed standardized estimates of effect sizes. For continuous variables, we used the Cohen's *d* statistic, which represents the difference between means divided by the pooled S.D. of the groups [65]. For dichotomous variables, we used relative risks (RRs) as a measure of effect size (Table 1).

3. Results

3.1. Study sample and interventions

A total of six studies met the preestablished criteria for inclusion in the systematic review. Four focused on populations with addictive disorders [66–69] and two on patients with serious mental disorders [70,71]. All were randomized trials.

All six studies met criteria for adequate quality of randomized clinical trials [64]. As is the case in any organizational or practice-based intervention, fully blinded approaches were not possible in any of the studies, since both subjects and providers were aware of the study condition.

3.2. Interventions

Umbricht-Schneiter et al. [69] evaluated the effectiveness of on-site medical care by a primary care physician for a population of intravenous drug users in an inpatient methadone clinic with one of four medical conditions (hypertension, PPD-positive status, HIV-positive status or another sexually transmitted disease) and without a primary care provider. Subjects in the active care program were treated on-site or via a follow-up appointment. Subjects in the

Table 1
Interventions for improving primary care for persons with mental health and/or addictive disorders

Study	Study population	Intervention (duration)	Linkage with primary care	Quality of primary care	Medical outcomes	Substance/mental health outcomes	Cost
Umbricht-Schneiter et al. [69]	51 adults with in a methadone clinic with one of four target medical conditions (hypertension, PPD+, HIV+ and acute STD)	On-site medical evaluation and treatment in the methadone clinic (2 months)	One or more primary care visit: 92% of subjects in intervention group vs. 35% in control group (RR=2.6, $P<.001$)	Quality of care for four target medical conditions: better in the intervention than the control group for three out of four measures	Not assessed	Not assessed	Not assessed
Willenbring and Olson [67]	105 veterans with alcohol dependence and alcoholism-related medical illness	Primary care provider delivers medical care and alcohol counseling in general medical clinic with supervision by addiction expert (24 months)	Annual number of primary care visits: greater in intervention than control (Cohen's $d=1.1$, $P<.01$)	Not assessed	TOMHS Physical Well-being score: for relative improvement, Cohen's $d=0.56$, $P=.02$); mortality: 19% in the intervention group vs. 30% in control (RR=0.63; $P=.03$ for bivariate comparison, NS for Cox survival analysis)	ETOH abstinence: greater in active group than control (RR=1.54, $P=.02$)	Costs not formally assessed (annual clinic cost estimated at US$1100 based on outpatient utilization data)
Druss et al. [70]	120 adults with serious mental illness treated in a VA mental health clinic	On-site primary care provider, nurse practitioner and nurse case manager manage medical care (12 months)	One or more primary care visit: greater in intervention than control (RR=1.26, $P=.006$)	Quality of preventive medical care: 15/17 measures significantly better for intervention than control	SF-36 PCS: greater improvement in intervention than control; Cohen's $d=0.51$, $P<.01$	SF-36 Mental Component Summary, Cohen's $d=0.04$, $P=.87$)	Total costs: not different (Cohen's $d=0.10$, $P=.67$)
Weisner et al. [68], Parthasarathy et al. [73]	592 adults with alcohol and other addictive disorders in a staff-model HMO; 341 subjects had a substance-related medical condition (SAMC)	On-site primary care providers, medical assistant and nurses provide care in a chemical dependency program (follow-up at 12 months)	One or more primary care visit in subsample with SAMC: no difference for subsample with SAMC or for full sample (RR=1.02, $P=.73$)	New diagnosis of medical conditions in subsample with SAMC; more new conditions diagnosed in intervention than control group	Not reported	Abstinence in subsample with SAMC; those in integrated care were more likely to be abstinent than those in usual care (69% vs. 55%; $P=.006$) (NS for full sample)	Cost in subsample with SAMC: Pre-post annual decrease greater in intervention than control (Cohen's $d=0.23$, $P=.02$) (NS for full sample)
Samet et al. [66]	470 adults in an inpatient unit for alcohol, heroin or cocaine detoxification	Multidisciplinary evaluation during inpatient detoxification with facilitated referral to community primary care (linkage assessed at 12 months; other outcomes assessed at 24 months)	69% of subjects in intervention vs. 53% in control group had a successful linkage to a primary care provider (RR=1.30, $P<.001$)	Not assessed	SF-36 PCS: no difference (Cohen's $d=0.0$, $P=1.0$)	SF-36 Mental Component Summary: Cohen's $d=0.18$, $P=.87$	Not assessed
Rubin et al. [71]	139 adult psychiatric inpatients	In-house evaluation by a consulting internist	Primary care physician called at admission and discharge, 81% vs. 40% (RR=2.0, $P=.04$)	12/17 process measures improved in intervention group	Not assessed	Not assessed	US$8558 in intervention group vs. US$8527 control group ($P=.68$)

usual care group were responsible for obtaining an appointment in the medical clinic.

Willenbring and Olson [67] evaluated a model in which primary care physicians and nurse practitioners delivered both medical care and alcohol treatment to veterans with alcohol dependence and alcohol-related medical illness. Each patient received a 1- or 2-day inpatient evaluation by a multidisciplinary team, followed by monthly outpatient visits with a nurse practitioner or primary care clinician. Subjects in the usual care group were referred both for alcoholism treatment evaluation and for outpatient medical care.

Druss et al. [70] evaluated a multidisciplinary clinic delivering primary medical care for veterans with serious mental disorders. The clinic, which was contiguous to the mental health clinic, was staffed by a nurse practitioner, part-time family practitioner and nurse case manager. Subjects in the usual care clinic were referred to the VA general medical clinic, located in a building adjacent to the mental health clinic.

Weisner et al. [68] assessed the impact of a multidisciplinary medical clinic in a chemical dependency program of a staff-model HMO. The clinic was staffed by three physicians with specialty training in substance abuse, a medical assistant and two nurses. Subjects in the usual care group received the same set of substance abuse services, but medical care was provided by the HMO's primary care clinics.

Samet et al. [66] assessed the effectiveness of an on-site evaluation and referral to community primary care in a residential detoxification program. The clinical team, consisting of a physician trained in internal medicine, a nurse and a social worker, met with the subject, performed a comprehensive assessment and then provided a facilitated referral to an outpatient primary care provider. Subjects in the usual care group did not receive an evaluation or formal referral.

Rubin et al. [71] examined the effects of on-site medical evaluation by an internist for patients in an inpatient psychiatric unit. The internist performed a medical history and physical examination, communicated with the primary care provider and arranged for completion of any indicated health maintenance services. Subjects in usual care obtained routine care from the inpatient psychiatric house staff.

3.3. Linkage and quality of primary care

Linkage with primary care, defined as one or more appointments with a general medical provider, was assessed in all six studies. Five of the studies found a statistically significant improvement in primary care linkage in the intervention group. Umbricht-Schneiter et al. [69] found a 2.6 times increase in linkage (92% intervention vs. 32% control, $\chi^2=18.0$, $df=1$, $P<.001$), Druss et al. [70] found a 1.27 times increase (91.5% vs. 72.1%, $\chi^2=7.5$, $df=1$, $P=.006$), and Samet et al. [66] found a 1.30 times increase (69% vs. 53%, $\chi^2=12.2$, $df=1$, $P<.001$). Willenbring and Olson [67] did not report the proportion of subjects with one or more visit, but did report a substantially higher number of annual primary care visits in intervention than control subjects [42.2 vs. 17.4 visits, Cohen's d statistic=1.1 (large effect), $t=5.42$, $df=99$, $P<.01$]. Rubin et al. [71] found a twofold rate of primary care linkage in the intervention than in the control group (81% vs. 40%, RR=2.0, $P=.04$). Weisner et al. [68] reported no difference in use of primary care services between the intervention (60%) and usual care (59%) conditions (RR=1.02, $\chi^2=0.12$, $df=1$, $P=.73$), although all individuals in that study had a primary care provider at baseline.

In all of five studies that reported medical quality, there was a significant improvement in the intervention vs. the control group. Umbricht-Schneiter et al. [69] found significantly improved treatment of three of four target conditions (hypertension, tuberculosis screening and sexually transmitted diseases). Druss et al. [70] found significantly improved performance on 15 of 17 preventive activities recommended in practice guidelines. Weisner et al. [68] reported increased rates of diagnosis of four common medical conditions (arthritis, headache, injuries and poisoning). Rubin found significantly improved performance on 12 of 17 quality process measures used in the program evaluation [71].

3.4. Medical and behavioral outcomes

Of two studies that used the SF-36 Physical Component Summary (PCS) score as a study outcome [66,70], one found a significant improvement of moderate magnitude in the intervention group (Cohen's $d=0.51$, $t=3.7$, $df=170$, $P<.001$) [70] and the other found no change (Cohen's $d=0.0$, $t=0$, $df=315$, $P=1$) [66]. Of note, the second study [70] was conducted in a population with a relatively healthy population; the baseline score PCS score (50.3) was nearly identical to the normative value for the general population (50.1) [72].

One other study used a physical subscale for the Treatment of Mild Hypertension Study (TOMHS) Health and Well-being Scale as a primary health outcome [67]. Although there was no significant difference between intervention and control groups at 2-year follow-up (44.1 usual care vs. 44.8 control), the intervention group had a lower score on this measure at baseline (37.2 vs. 41.8). Reanalysis of these data examining change in scores (our predetermined metric for study effect) found a moderate-to-large difference in the improvement in the TOMHS scores between the intervention and control groups (9- vs. 2.3-point improvement, Cohen's $d=0.56$, $t=2.4$, $df=73$ $P=.02$).

In the only study that reported mortality, death rates in the intervention group were one third lower (19% vs. 30%, RR=0.63) than the control group [67]. This difference was significant in the bivariate comparison ($\chi^2=4.5$, $df=1$, $P=.03$), but not in a Cox survival analysis due to limited statistical power.

Three of four interventions in subjects with addictive disorders examined abstinence rates [66–68]. One study [67] that focused on medically ill patients with alcoholism

found a 1.54 times increase in alcohol abstinence in the intervention as compared with the active group (74% vs. 48%, χ^2=5.4, *df*=1, *P*=.02), whereas a second study examining a population with a range of comorbidity found no difference in abstinence [66]. Finally, one study found no difference in rates of abstinence across the full sample, but found a 1.25 times increase in rates of abstinence in preplanned analyses of a subsample of individuals with addictive related medical and mental disorders (69% vs. 55%, χ^2=7.7, *df*=1, *P*=.006) [68].

3.5. Costs

Three studies formally assessed costs of the programs [68,70,71]. Two of the studies measured intervention costs separately based on staff salaries and activities [68,70]. The third used charges obtained from the hospital's billing database [71].

In each study, modest increases in outpatient expenditures combined with nonsignificant but larger declines in inpatient and emergency room use to produce interventions that were cost-neutral from a health plan perspective. In an analysis of the Weisner data focusing on pre-post change in expenditures [73], the subsample of patients with substance-related mental and medical comorbidities experienced a US$2773 pre-post decline in annual costs for the intervention group vs. a US$702 decline for control (*P*=.02 for Group×Time interaction).

4. Discussion

The studies covered in this review suggest the potential for improving linkage to, and quality of, primary medical care, in persons with mental and addictive disorders, at a relatively modest cost. At the same time, the paucity of studies on the topic suggests a need for greater research on the topic. Great strides have been made in the development and testing of models to improve the diagnosis and treatment of mental and addictive disorders in primary care [74–77]. Now, similar research, clinical and policy attention is needed to the parallel issue of improving medical care for persons with behavioral disorders [42,51,53,54,78].

4.1. The importance of comorbidity

There was a consistent pattern across the studies demonstrating greater benefits on health and abstinence outcomes in populations with worse health or with medical comorbidity at baseline. Although primary care is important for all populations, its effects are most visible in individuals with the greatest unmet health needs [57, 79]. Because much of the value of chronic care programs is in improving coordination, their impact may be greatest for patients with comorbid conditions, who are at greatest risk for service fragmentation [80].

The importance of comorbidity was evident not only on the boundary between behavioral health and medical care, but, within behavioral care, between addictive and mental health. The only study to examine outcomes for patients with comorbidity found that an integrated medical program was particularly beneficial, and cost-effective, for individuals with comorbid mental and addictive disorders [68,73]. Individuals with addictive, mental health and medical concerns commonly must obtain care from three separate systems [81]. As compared with individuals with single addictive or mental disorders, individuals with dual mental and substance diagnoses are at risk not only for elevated risk of medical comorbidity [82], but also for disproportionately poor quality of medical services [83]. Dually diagnosed populations, for whom the gap between needs and availability is greatest, may have the most to gain from improvement in coordination of services.

4.2. A continuum of approaches to integrating medical care for persons with mental and addictive disorders

The interventions described in this review took a variety of approaches to improving medical care in the study populations. Each of the models discussed in this review was developed to fit the needs of the particular population it served and the system in which it was implemented. Thus, examining the crosswalk between interventions and systems

Table 2
A continuum of approaches for improving medical care in persons with mental health and addictive disorders

Model	MH staff provide medical care	Medical consultation	Collaborative care	Facilitated referral to primary care
Level of involvement by primary care providers	Low	Low-intermediate	Intermediate-high	High
Examples	Shore [85]	Umbricht-Schneiter et al. [69]	Willenbring and Olson [67]	Samet et al. [66]
	Golomb et al. [86]	Rubin et al. [71]	Druss et al. [70] Weisner et al. [68]	
Requirements	Training for MH professionals	Sufficient patient population and funding mechanisms to support consultant	Regular contact between medical and mental health/addiction staff	Adequate community medical resources
Co-location of services?	Yes	Yes	Yes or no	No
Potential sites	Sites with doubly boarded clinicians	Inpatient MH and addiction settings	Staff-model HMOs, VA	Freestanding mental health and addiction settings

in which they were used may be useful in helping inform future efforts to develop models that can be implemented and sustained in routine settings.

Bower and Gilbody [84] have described a continuum of approaches to improving treatment for mental disorders in primary care based on the degree of involvement by mental health staff, ranging from minimal (e.g., training PCPs) through referral models, in which mental health providers deliver all services. A parallel continuum can be described for approaches improving quality of medical care for persons with behavioral disorders based on the level of involvement of primary care medical providers in that care (Table 2).

At one end of the spectrum are models in which psychiatrists and mental health providers are trained to provide screening, preventive and routine medical services for their patients. Although these approaches have been proposed for psychiatrists in the public sector [85], they have, to date, not been widely adopted in routine practice. For mental health providers to take on more responsibility for their patients' medical care, they will require adequate training, adequate time to allow them to take on these tasks and appropriate expectations for the types of services they can safely deliver [86].

Two studies in this review used a consultation approach, in which an internist provided evaluation and selected services on-site [69,71]. Each of these interventions was implemented in an inpatient behavioral treatment unit, which is likely the most appropriate setting for these consultation models. Consultation approaches fit well with these inpatient settings because patients are typically not able to travel offsite for a medical care, and consultants can see multiple patients in a single block of time.

Three studies [68,70,87] used team-based approaches that most closely resemble the "collaborative care" models used for improving the care of common mental disorders in primary care. This approach, based on Wagner's Chronic Care Model [88], uses a multidisciplinary team including both mental health and primary care providers to ensure coordination and follow-up with care [89]. For the treatment of depression in primary care, collaborative care models were initially developed in vertically integrated settings such as VA and staff-model HMOs in which blended funding and geographic proximity make it possible to establish and maintain successful multidisciplinary teams. However, these models are increasingly being adapted to permit their use in a broader range of community settings. Studies such as IMPACT [90], RESPECT [91] and the Robert Wood Johnson Depression in Primary Care Program [92,93] are seeking to develop sustainable approaches to implementing these collaborative care models in a wider range of community settings.

Similarly, the studies in the current review taking this collaborative care approach were all conducted in either the VA [70,87] or at Kaiser Permanente, a staff-model HMO [94]. However, there is the potential to work to extend these team-based models to other nonintegrated public sector clinics as well. Several programs in the public sector have begun to implement programs using multidisciplinary teams to coordinate care between mental health and primary care teams [95]. Regardless of whether services are collocated, the key element of these collaborative care approaches is that they involve functionally integrated care teams.

Most freestanding mental or addictive clinics are unlikely to have the staffing expertise, economies of scale or financial incentives to provide much primary care on-site. Facilitated referrals to primary care may be a pragmatic approach for improving general medical services in these populations. For depression in primary care, results from the PRISM-E study suggest that facilitated referral models can lead to improvement in depression outcomes [96,97]. Similarly, facilitated referral may be a practical approach for providing medical care in freestanding mental health and substance abuse clinics [66]. For these approaches to be effective, however, it is critical that there be adequate primary care resources in the community, formal referral mechanisms, and strategies for communication and information sharing to ensure access to, and coordination with, primary care providers.

4.3. Limitations

At least two limitations to this review should be noted. First, as previously noted, only a small number of studies met the prespecified criteria for study entry. We consider this to be both a limitation and a finding in and of itself. Second, the heterogeneity of the populations, interventions and outcome measures limited the opportunity for formal meta-analytic pooling of results across studies. It will be important for future research in the area to use standardized measures of quality and health status, as well as intervention characteristics such as degree of functional integration of care, to make it possible to combine data across studies.

4.4. Conclusions

There is much work to be done in developing, testing and implementing models to improve medical care in persons with mental and addictive disorders. The body of research in this area is surprisingly small, given the morbidity, mortality and barriers to care faced by this population. At the same time, the existing studies suggest considerable potential for improving quality of medical care in this vulnerable population. Rather than seeking a "one-size-fits-all" solution to this problem, it will be important to develop a range of approaches and then help local sites to adapt those models to their own needs and capacities.

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References

[1] Tsuang MT, Perkins K, Simpson JC. Physical diseases in schizophrenia and affective disorder. J Clin Psychiatry 1983;1998:42–6.

[2] Jeste DV, Gladsjo JA, Lindamer LA, Lacro JP. Medical comorbidity in schizophrenia. Schizophr Bull 1996;22(3):413–30.

[3] De Alba I, Samet JH, Saitz R. Burden of medical illness in drug- and alcohol-dependent persons without primary care. Am J Addict 2004; 13(1):33–45.

[4] Kilbourne AM, Cornelius J, Han X, Pincus HA, Shad M, Salloum I, et al. Burden of general medical conditions among individuals with bipolar disorder. Bipolar Disord 2004;6(5):368–73.

[5] Sokal J, Messias E, Dickerson FB, Kreyenbuhl J, Brown CH, Goldberg RW, et al. Comorbidity of medical illnesses among adults with serious mental illness who are receiving community psychiatric services. J Nerv Ment Dis 2004;192(6):421–7.

[6] Jones DR, Macias C, Barreira PJ, Fisher WH, Hargreaves WA, Harding CM. Prevalence, severity, and co-occurrence of chronic physical health problems of persons with serious mental illness. Psychiatr Serv 2004;55(11):1250–7.

[7] Stein M. Medical consequences of substance abuse. Psychiatr Clin North Am 1999;22(2):351–70.

[8] Goldman L. Comorbid medical illness in psychiatric patients. Curr Psychiatry Rep 2000;2(3):256–63.

[9] Dickey B, et al. Medical morbidity, mental illness, and substance use disorders. Psychiatr Serv 2002;53(7):861–7.

[10] Tsuang MT, Woolson R. Mortality in patients with schizophrenia, mania, depression and surgical conditions. A comparison with general population mortality. Br J Psychiatry 1977;130:162–6.

[11] Tsuang MT, Woolson R. Excess mortality in schizophrenia and affective disorders. Do suicides and accidental deaths solely account for this excess? Arch Gen Psychiatry 1978;35(10):1181–5.

[12] Frasure-Smith N, Lesperance F, Talajic M. Depression following myocardial infarction. Impact on 6-month survival. JAMA 1993; 270(15):1819–25.

[13] Moos RH, Brennan P, Mertens JR. Mortality rates and predictors of mortality among late-middle aged and older substance abuse patients. Alcohol Clin Exp Res 1994;18(1):187–95.

[14] Felker B, Yazel J, Short D. Mortality and medical comorbidity among psychiatric patients: a review. Psychiatr Serv 1996;47(12):1356–63.

[15] Penninx BW, Geerlings S, Deeg DJ, van Eijk JT, van Tilburg W, Beekman AT. Minor and major depression and the risk of death in older persons. Arch Gen Psychiatry 1999;56(10):889–95.

[16] Harris EC, Barraclough B. Excess mortality of mental disorder. Br J Psychiatry 1998;173:11–53.

[17] Dembling BP, Chen D, Vachon L. Life expectancy and causes of death in a population treated for serious mental illness. Psychiatr Serv 1999;50(8):1036–42.

[18] Maltzberg B. Mortality among patients with mental disease. Utica: New York State Hospital Press; 1934.

[19] Black D. Iowa record-linkage study: death rates in psychiatric patients. J Affect Disord 1998;50(2–3):277–82.

[20] Room R, Babor T, Rehm J. Alcohol and public health. Lancet 2005;365(9458):519–30.

[21] Hannerz H, Borga P, Borritz M. Life expectancies for individuals with psychiatric diagnoses. Public Health 2001;115(5):328–37.

[22] Katon WJ. Clinical and health services relationships between major depression, depressive symptoms, and general medical illness. Biol Psychiatry 2003;54(3):216–26.

[23] Lieber C. Medical disorders of alcoholism. N Engl J Med 1995;333 (16):1058–65.

[24] Glassman AH, Bigger Jr J. Antipsychotic drugs: prolonged QTc interval, torsade de pointes, and sudden death. Am J Psychiatry 2001;158(11):1774–82.

[25] Leslie DL, Rosenheck R. Incidence of newly diagnosed diabetes attributable to atypical antipsychotic medications. Am J Psychiatry 2004;161(9):1709–11.

[26] Roose S. Considerations for the use of antidepressants in patients with cardiovascular disease. Am Heart J 2000;140(4 Suppl):84–8.

[27] Whyte EM, Pollock B, Wagner WR, Mulsant BH, Ferrell RE, Mazumdar S, et al. Influence of serotonin-transporter-linked promoter region polymorphism on platelet activation in geriatric depression. Am J Psychiatry 2001;158(12):2074–6.

[28] Josiassen RC, Schindler B. Medical comorbidity and schizophrenia. Schizophr Bull 1996;22(3):411–2.

[29] Spiegel D, Giese-Davis J. Depression and cancer: mechanisms and disease progression. Biol Psychiatry 2003;54(3):269–82.

[30] Berger H, Schweigler M. Smoking characteristics of methadone patients. JAMA 1972;222(6):705.

[31] Glassman A. Cigarette smoking: implications for psychiatric illness. Am J Psychiatry 1993;150(4):546–53.

[32] McCreadie R, MacDonald E, Blacklock C, Tilak-Singh D, Wiles D, Halliday J, et al. Dietary intake of schizophrenic patients in Nithsdale, Scotland: case-control study. BMJ 1998;317(7161):784–5.

[33] Brown S, Birtwistle J, Roe L, Thompson C. The unhealthy lifestyle of people with schizophrenia. Psychol Med 1999;29(3):697–701.

[34] Lasser K, Boyd J, Woolhandler S, Himmelstein DU, McCormick D, Bor DH. Smoking and mental illness: a population-based prevalence study. JAMA 2000;284(20):2606–10.

[35] Richter KP, Gibson C, Ahluwalia JS, Schmelzle KH. Tobacco use and quit attempts among methadone maintenance clients. Am J Public Health 2001;91(2):296–9.

[36] Daumit GL, Clark J, Steinwachs DM, Graham CM, Lehman A, Ford DE. Prevalence and correlates of obesity in a community sample of individuals with severe and persistent mental illness. J Nerv Ment Dis 2003;191(12):799–805.

[37] Koran LM, Sox Jr H, Marton KI, Moltzen S, Sox CH, Kraemer HC, et al. Medical evaluation of psychiatric patients. I. Results in a state mental health system. Arch Gen Psychiatry 1989;46(8): 733–40.

[38] Berren MR, Santiago J, Zent MR, Carbone CP. Health care utilization by persons with severe and persistent mental illness. Psychiatr Serv 1999;50(4):559–61.

[39] Cradock-O'Leary J, Young A, Yano EM, Wang M, Lee ML. Use of general medical services by VA patients with psychiatric disorders. Psychiatr Serv 2002;53(7):874–8.

[40] Desai MM, Rosenheck R, Druss BG, Perlin JB. Mental disorders and quality of diabetes care in the veterans health administration. Am J Psychiatry 2002;159(9):1584–90.

[41] Dickerson FB, McNary S, Brown CH, Kreyenbuhl J, Goldberg RW, Dixon LB. Somatic healthcare utilization among adults with serious mental illness who are receiving community psychiatric services. Med Care 2003;41(4):560–70.

[42] Marder SR, Essock S, Miller AL, Buchanan RW, Casey DE, Davis JM, et al. Physical health monitoring of patients with schizophrenia. Am J Psychiatry 2004;161(8):1334–49.

[43] Koryani E. Morbidity and rate of undiagnosed physical illness in a psychiatric clinic population. Arch Gen Psychiatry 1979;36:414–9.

[44] Wells KB, Sherbourne C, Sturm R, Young AS, Burnam MA. Alcohol, drug abuse, and mental health care for uninsured and insured adults. Health Serv Res 2002;37(4):1055–66.

[45] Saitz R, Larson M, Horton NJ, Winter M, Samet JH. Linkage with primary medical care in a prospective cohort of adults with addictions in inpatient detoxification: room for improvement. Health Serv Res 2004;39(3):587–606.

[46] Druss BG, Rosenheck RA. Mental disorders and access to medical care in the United States. Am J Psychiatry 1998;155(12):1775–7.

[47] DiMatteo MR, Lepper H, Croghan TW. Depression is a risk factor for noncompliance with medical treatment: meta-analysis of the effects of anxiety and depression on patient adherence. Arch Intern Med 2000;160(14):2101–7.

[48] Cohen MH, Cook J, Grey D, Young M, Hanau LH, Tien P, et al. Medically eligible women who do not use HAART: the importance of abuse, drug use, and race. Am J Public Health 2004;94(7):1147–51.

[49] Hodges B, Inch C, Silver I. Improving the psychiatric knowledge, skills, and attitudes of primary care physicians, 1950–2000: a review. Am J Psychiatry 2001;158(10):1579–86.
[50] Lester H, Tritter JQ, Sorohan H. Patients' and health professionals' views on primary care for people with serious mental illness: focus group study. BMJ 2005;330(7500):1122.
[51] Samet JH, Friedmann P, Saitz R. Benefits of linking primary medical care and substance abuse services: patient, provider, and societal perspectives. Arch Intern Med 2001;161(1):85–91.
[52] McLellan A, Hagan TA, Levine M, Meyers K, Gould F, Bencivengo M, et al. Does clinical case management improve outpatient addiction treatment. Drug Alcohol Depend 1999;55(1–2):91–103.
[53] Koyanagi C. Get it together: how to integrate physical and mental health care for people with serious mental disorders. Washington (DC): Bazelon Center; 2004.
[54] Bartels S. Caring for the whole person: integrated health care for older adults with severe mental illness and medical comorbidity. J Am Geriatr Soc 2004;52:S249–57.
[55] Druss BG, Bradford W, Rosenheck RA, Radford MJ, Krumholz HM. Quality of medical care and excess mortality in older patients with mental disorders. Arch Gen Psychiatry 2001;58(6): 565–72.
[56] Gelberg L, Andersen R, Leake BD. The behavioral model for vulnerable populations: application to medical care use and outcomes for homeless people. Health Serv Res 2000;34(6):1273–302.
[57] Blumenthal D, Mort E, Edwards J. The efficacy of primary care for vulnerable population groups. Health Serv Res 1995;30(1 Pt 2): 253–73.
[58] Starfield B, Shi L, Macinko J. Contribution of primary care to health systems and health. Milbank Q 2005;83(3):457–502.
[59] Cochrane Effective Practice and Organisation of Care Group (EPOC). Data Collection Checklist. University of Ottawa: Institute of Population Health; 2002.
[60] Katon WJ, et al. The pathways study: a randomized trial of collaborative care in patients with diabetes and depression. Arch Gen Psychiatry 2004;61(10):1042–9.
[61] Williams Jr JW, et al. The effectiveness of depression care management on diabetes-related outcomes in older patients. Ann Intern Med 2004;140(12):1015–24.
[62] Glassman AH, et al. Sertraline treatment of major depression in patients with acute MI or unstable angina. JAMA 2002;288(6):701–9.
[63] Berkman LF, et al. Effects of treating depression and low perceived social support on clinical events after myocardial infarction: the Enhancing Recovery in Coronary Heart Disease Patients (ENRICHD) Randomized Trial. JAMA 2003;289(23):3106–16.
[64] Jadad AR, Moore R, Carroll D, Jenkinson C, Reynolds DJ, Gavaghan DJ, et al. Assessing the quality of reports of randomized clinical trials: is blinding necessary? Control Clin Trials 1996;17(1):1–12.
[65] Cohen J, editor. Statistical power analysis for the behavioral sciences. 2nd ed. Hillsdale (NJ): Lawrence Earlbaum Associates; 1988.
[66] Samet JH, Larson M, Horton NJ, Doyle K, Winter M, Saitz R. Linking alcohol- and drug-dependent adults to primary medical care: a randomized controlled trial of a multi-disciplinary health intervention in a detoxification unit. Addiction 2003;98(4):509–16.
[67] Willenbring ML, Olson D. A randomized trial of integrated outpatient treatment for medically ill alcoholic men. Arch Intern Med 1999; 159(16):1946–52.
[68] Weisner C, Mertens J, Parthasarathy S, Moore C, Lu Y. Integrating primary medical care with addiction treatment: a randomized controlled trial. JAMA 2001;286(14):1715–23.
[69] Umbricht-Schneiter A, Ginn D, Pabst KM, Bigelow GE. Providing medical care to methadone clinic patients: referral vs on-site care. Am J Public Health 1994;84(2):207–10.
[70] Druss BG, Rohrbaugh R, Levinson CM, Rosenheck RA. Integrated medical care for patients with serious psychiatric illness: a randomized trial. Arch Gen Psychiatry 2001;58(9):861–8.
[71] Rubin AS, et al. Effects on processes and costs of care associated with the addition of an internist to an inpatient psychiatry team. Psychiatr Serv 2005;56(4):463–7.
[72] Ware JE, Kosinski M, Keller SD. SF-36 physical and mental health summary scales: a user's manual. Boston (Mass): The Health Institute, New England Medical Center; 1994.
[73] Parthasarathy S, Mertens J, Moore C, Weisner C. Utilization and cost impact of integrating substance abuse treatment and primary care. Med Care 2003;41(3):357–67.
[74] Whitlock EP, Polen M, Green CA, Orleans T, Klein J. Behavioral counseling interventions in primary care to reduce risky/harmful alcohol use by adults: a summary of the evidence for the U.S. Preventive Services Task Force. Ann Intern Med 2004;140(7):557–68.
[75] Badamgarav E, Weingarten S, Henning JM, Knight K, Hasselblad V, Gano Jr A. Effectiveness of disease management programs in depression: a systematic review. Am J Psychiatry 2003;160(12):2080–90.
[76] Fiellin DA, O'Connor P. Clinical practice. Office-based treatment of opioid-dependent patients. N Engl J Med 2002;347(11):817–23.
[77] Gilbody S, Whitty P, Grimshaw J, Thomas R. Educational and organizational interventions to improve the management of depression in primary care: a systematic review. JAMA 2003;289(23):3145–51.
[78] McLellan AT, Lewis D, O'Brien CP, Kleber HD. Drug dependence, a chronic medical illness: implications for treatment, insurance, and outcomes evaluation. JAMA 2000;284(13):1689–95.
[79] Starfield B. Primary care and its relationship to health from primary care: balancing health needs, services, and technology. New York: Oxford University Press; 1998. p. 3–17.
[80] Rothman AA, Wagner EH. Chronic illness management: what is the role of primary care? Ann Intern Med 2003;138(3):256–61.
[81] Epstein J, Barker P, Vorburger M, Murtha C. Serious mental illness and its co-occurrence with substance use disorders. Rockville (MD): Department of Health and Human Services; 2002 [DHHS Publication No. SMA 04-3905, Analytic Series A-24].
[82] Dickey B, Normand SL, Weiss RD, Drake RE, Azeni H. Medical morbidity, mental illness, and substance use disorders. Psychiatr Serv 2002;53(7):861–7.
[83] Druss B, Rosenheck RA, Desai MM, Perlin JB. Quality of preventive medical care for patients with mental disorders. Med Care 2002;40(2): 129–36.
[84] Bower P, Gilbody S. Managing common mental health disorders in primary care: conceptual models and evidence base. BMJ 2005;330 (7495):839–42.
[85] Shore JH. Psychiatry at a crossroad: our role in primary care. Am J Psychiatry 1996;153(11):1398–403.
[86] Golomb BA, et al. The role of psychiatrists in primary care of patients with severe mental illness. Psychiatr Serv 2000;51(6):766–73.
[87] Willenbring ML, Olson DH. A randomized trial of integrated outpatient treatment for medically ill alcoholic men. Arch Intern Med 1999;159(16):1946–52.
[88] Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness. JAMA 2002;288(14):1775–9.
[89] Katon W, et al. Collaborative management to achieve treatment guidelines. Impact on depression in primary care. JAMA 1995; 273(13):1026–31.
[90] Unutzer J, et al. Collaborative care management of late-life depression in the primary care setting: a randomized controlled trial. JAMA 2002;288(22):2836–45.
[91] Dietrich AJ, et al. Re-engineering systems for the treatment of depression in primary care: cluster randomised controlled trial. BMJ 2004;329(7466):602.
[92] Pincus HA, et al. Depression in primary care: bringing behavioral health care into the mainstream. Health Aff (Millwood) 2005;24(1): 271–6.
[93] Kilbourne AM, et al. Translating evidence-based depression management services to community-based primary care practices. Milbank Q 2004;82(4):631–59.

[94] Weisner C, et al. Integrating primary medical care with addiction treatment: a randomized controlled trial. JAMA 2001;286(14): 1715–23.

[95] Bazelon Center C. Get it together. How to integrate physical and mental health care for people with serious mental disorders. Washington (DC): Judge David L. Bazelon Center for Mental Health Law; 2004.

[96] Bartels SJ, et al. Improving access to geriatric mental health services: a randomized trial comparing treatment engagement with integrated versus enhanced referral care for depression, anxiety, and at-risk alcohol use. Am J Psychiatry 2004;161(8):1455–62.

[97] Krahn D, et al. PRISM-E: depression and at-risk alcohol use outcomes for older primary care patients in integrated care and enhanced specialty referral. Academy Health. Boston (Mass), 2005.