

Extrinsic Factors Influencing the Person's Motivation for Engagement and Retention in the Addiction Recovery Process. A Systematic Literature Review

Boniface Harerimana^{1*,2,3}, Richard Csiernik⁴, Michael Kerr³, Cheryl Forchuk^{2,3}

¹Ndera Neuro-Psychiatric Hospital, Kigali City, Rwanda.

²Lawson Health Research Institute, London, Ontario, Canada

³Arthur Labatt Family School of Nursing, Faculty of Health Sciences, Western University, London, Ontario, Canada

⁴School of Social Work, King's University College, Western University, London Ontario, Canada

*Corresponding author: Boniface Harerimana. Ndera Neuro-Psychiatric Hospital, P.O. Box 423, Kigali City, Rwanda. Email: bharerim@uwo.ca

ABSTRACT

Background

Globally, up to 80% of patients enrolled for addiction care are lost to follow-up within the first three months of treatment. This review synthesizes evidence on extrinsic factors that influence motivation for engaging in addiction recovery and corresponding empirical definitions.

Methods

A systematic search for peer-reviewed articles was conducted through electronic databases, including Ovid MEDLINE, PsychINFO, CINAHL, and scanning references. The included articles were published in English or French between 1946 and 2018.

Results

The identified sixteen articles indicated that extrinsic factors for the person's engagement and retention in the addiction recovery process included: motivation-enhancing healthcare structures, therapeutic relationships, and supportive social networks. Results also indicated that empirical definitions of motivation for engagement and retention in the addiction recovery process varied across studies.

Conclusion

Extrinsic factors can influence the person's motivation for engagement and retention in the addiction recovery. Research with full operational definitions of motivation for engagement and retention in the addiction recovery is needed.

Keywords: Addiction recovery; engagement; extrinsic factors; motivation; retention

INTRODUCTION

Over the last two decades, substance use disorders (SUD), such as alcohol and drug use addiction have been a global public health concern. Globally, evidence on SUDs demonstrated that about 240 million and one billion people suffered from alcohol use disorders and smoked tobacco respectively.[1] Alcohol use disorders contributed to 257 disability-adjusted life years per 100,000 population and tobacco smoking is associated with 11% deaths in males and 6% deaths in females each year.[1] Additionally, 5% of the world adult population used an illicit drug, such as opioids, cocaine, amphetamines, hallucinogens, at least once; and of whom 0.6% had clinically diagnosable drug addiction in 2015.[2] These estimates are approximately equivalent to a quarter billion individuals who used drugs and 29.5 million living with drug addiction across the world.[2] SUD contributed to a total annual global loss of 28 million healthy lives, including 190,000 premature deaths solely attributable to opioid

addiction worldwide.[2] Similarly, a recent analysis of the global burden of disease demonstrated that SUD are among the leading causes of years lived with disabilities (YLDs), accounting for 28.5% for global YLDs.[3]

Research has linked the ineffective stabilization of patients with addiction to increased risk of crimes.[4] Wealthy and low-resourced countries alike experience a high prevalence of addiction problems in criminal systems. The United Nations Office on Drugs and Crime (UNODC) reported that, in 2016, 35% and 19% of six sentenced women and men prisoners, respectively, were serving for substance-related crime worldwide.[5] Crimes related to substance use, such as robbery, drug trafficking and homicide in low-resourced, emerging economy, and wealthy countries range between 5% and 46% of all cases in their criminal justice systems.[6-9]

There have been international commitments to improving addiction prevention and treatment outcomes through the 1998 United Nation General Assembly Special Session on drugs. Subsequently, in 2000, the political declaration and action plan for international cooperation advocated for an integrated and balanced strategy to counter world drug problems.[10] Through the political declaration, 132 heads of states agreed on strategies, including pharmacotherapies and psychosocial interventions aimed at improving rehabilitation, recovery, and social reintegration of patients with SUDs.[10] Nonetheless, addiction care programs across the world continue to experience high rates of early attrition from treatment. Research has shown that dropout rates in the first three months of treatment can reach up to 80% among patients enrolled for addiction care,[11-13] and over 50% relapse in less than two months of their admission into addiction programs.[14]

Evidence has indicated that motivation plays a crucial role in the process of engaging in the person's behaviour change process.[15-17] A self-determination theory by Ryan and Deci asserts that a person's intrinsic motivation, i.e., inherent human drives towards growth, self-integration, and resolution of conflicting ideas about life, grows under the influences of interactions with extrinsic factors, and the external human conditions.[16] External human conditions, such as perceived rewards, praises, punishment, and orders directed to the person effect a behaviour change towards psychological growth, engagement, and wellness through the interactions with a component of intrinsic motivation referred to as autonomous motivation.[15] Given that autonomous motivation, an essential element for behaviour change is continuously subject to influences of external human conditions, [15-17] it is worth investigating extrinsic factors for engaging and remaining in the addiction recovery. Such an investigation may yield modifiable external conditions, which healthcare professionals and stakeholders may capitalize on to improve addiction care outcomes.

Research demonstrated that patients, who fully engage in self-endorsed actions towards the addiction recovery, are those whose extrinsic factors facilitate the recognition of substance-related consequences, perception of the importance of addiction behaviour change, and expression of desire for help.[18-20] As such, retaining a person in the addiction recovery process may be subject to a wide variety of extrinsic factors. However, in the current literature, little attention has been paid to either synthesizing evidence related to interactions

between extrinsic factors and addiction recovery outcomes. Additionally, assessing the patient progress in addiction recovery requires consistent and objective characteristics, that is, specific empirical definitions. In socio-behavioural research, empirical definitions also referred to as operational definitions, are crucial because they provide measurable dimensions through which the researchers examine non-observational variables of the phenomenon under investigation.[21] While, motivation and retention in the addiction recovery, as variables, have been extensively studied, definitions specific to these variables varied across studies. For example, some research assessed motivation by the patient's recognition of their problems, expression of desire for help and treatment readiness;[18] whereas theorists suggested assessing motivation through stages.[19] The use of different empirical definitions may make it difficult to interpret and utilize evidence related to these variables. As such, this gap in the current literature calls for synthesizing evidence about extrinsic factors influencing addiction recovery outcomes or their empirical definitions, which are used to evaluate these outcomes.[21]

This systematic review sought to synthesize literature that relates to the following questions: (1) what are the extrinsic factors that influence the person's motivation for engagement and retention in the addiction recovery process? (2) What empirical definitions are used to evaluate patients' motivation for engagement and retention in the addiction recovery process?

METHODS

Design

This review was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines.[22] Peer-reviewed articles were retrieved through electronic databases using MeSH terms and keywords. Two researchers independently used a pre-established protocol to select and assess the quality of eligible studies. Besides, other members of the research team individually evaluated the review process, importance and intellectual content of the article before discussing and approving the final version of the review report within the team.

Using the PICOS framework,[23] this systematic review included both experimental and observational studies that sampled people seeking addiction care services to examine factors contributing to the person's motivation for engagement and/or retention in the recovery process. As this review included both experimental and observational study designs, there was no single comparator.

Search strategy

The identification of articles through electronic databases was conducted using both MeSH keywords and free text searches. The search strategy encompassed a combination of MeSH keywords and free text, which used Boolean operators “AND” or “OR” with appropriate truncation, such as the use of parentheses to refine search and the asterisk for finding all terms with a given string of text. For Ovid MEDLINE(R) these MeSH keywords and free text were combined as follows: (1) engagement.mp, (2) addiction care.mp., (3) recovery, (4) exp Motivation, (5) motivation for engagement.mp., (6) 3 OR 4 AND 5, (7) exp Substance-Related/ Disorders, (8) exp Substance-Related Disorders, (9) 1 AND 7, (10) 2 or 6 and 8 and 9. This search strategy was adapted for other databases, i.e. PsychINFO and CINAHL.

Study selection

After searching each of the electronic databases, the identified research studies and corresponding abstracts and URL links were exported and stored on Microsoft Word outputs. Studies were selected if they had examined and reported data on the person’s engagement and/or retention in treatment and were published in English or French between 1st January 1946 and 30th June 2018. The review excluded duplicated articles, studies without a human sample, articles reporting a secondary data analysis, review articles, and papers whose full text was not

available (see Figure 1). At the final step, data extracted from articles included the following items: a full reference, date and place of publication, purpose/hypotheses, study designs, sampling procedures and sample size, measurements, and findings related to outcomes (Table 1).

Risk of bias and quality assessment

Critical appraisal is a key component of evidence-based practice; thus, the risk of bias and quality of studies were assessed with the Critical Appraisal Skills Programme (CASP) checklists. CASP checklists consist of a series of questionnaires devised to facilitate the formal assessment of the methodological quality, quantity, consistency, and the applicability of study findings. CASP checklists comprised cohort studies that have 12 criteria,[24] and 11 criteria for both randomized controlled trials,[25] and clinical predictive studies.[26] CASP checklists enabled the researchers to rate each individual study based on whether the authors addressed a coherent and clear research question, how the possibility of confounding, and various types of bias are handled. Scores for individual studies were ranked into three categories: high quality of evidence for studies whose scores were nine or over, acceptable for those scoring between seven and eight, and low quality for studies with a score below seven (for details on individual study score, see the last column of Table 1).

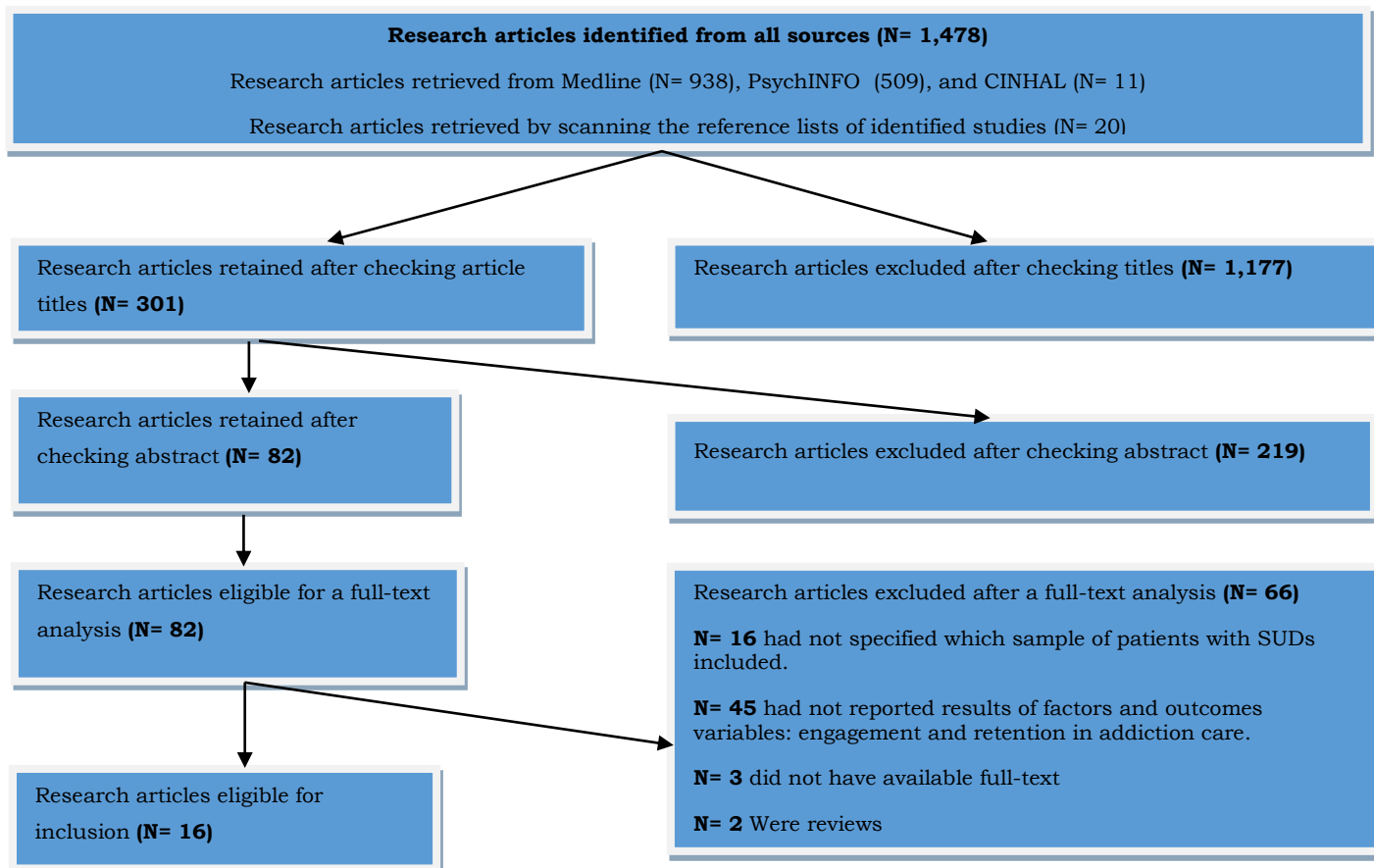


Figure 1. Flow diagram for the identification and selection of studies

RESULTS

The initial search retrieved 1,478 articles, which after checking their titles and abstracts, were narrowed down to 301 and 82 respectively. The included articles present a wide variety of characteristics and operationalization of variables related to motivation and retention in the addiction recovery process. This diversity of characteristics and measures made it difficult to aggregate data and to conduct a meta-analysis. Therefore, the synthesis consisted of discussing the results of each individual study and

organizing similar evidence under subheadings pertaining to the review research questions. In the studies included in this systematic review, to a varied extent, corresponding evidence attributed the person's motivation for engagement and retention in the addiction recovery process to factors, including motivation-enhancing health care structures and therapeutic relationships, supportive social networks, and patient characteristics. The results pertaining to these factors are synthesized and summarized in Table 1.

T a b l e 1. S u m m a r y o f r e s u l t s

| Refere nces | Publicati on | Objectives/Hypot heses | Study design | Sample size and character istics | Measurement s | Main results | Score/ quality | |
|----------------|----------------------------------|---------------------------|---|--|--|--|--|-----------------------------------|
| 1 | Wild, Cunnin gham (32) | 2006 Canada | To test if treatment motivation should account for unique variance in client engagement at treatment entry. | Cross- sectional predictive study | N =300 seeking treatment at the Behaviour Change Unit | Clients rated the extent to which their social networks pressured them using two modified versions of Polcin and Weisner's (1999) social pressure index. | Perceived coercion negatively affected identified motivation for treatment ($r = -.34, p < .001$). External treatment motivation was negatively correlated with alcohol dependence ($r = -.22,$ $p < .01$) and was uncorrelated with drug dependence. Social network pressure to cut down substance use vs external motivation was as low as $r = .41, p < .01$ and $r = .24, p < .001$ for introjected. | 7/11 Accepta ble Quality |
| 2 | Bischof , Iwen (34) | 2016 Germany | To engage treatment-refusing patients in alcohol treatment and to improve concerned others (CSO) functioning. | RCT with a three, six, and twelve- month follow-up. | 94 Concerne d significant others, family members of patients suffering from alcohol dependen ce. | Treatment utilization was assessed by received treatment for alcohol problems available in the community | At three months, participants in the intervention group had significant higher engagement rates compared to a waiting list (40.5% vs 13.9%, $p < 0.02$). But there were no significant rates differences between groups at six and twelve-month follow-up 47.6% vs 41.7%, $p < 0.84$) except for improvement for the psychological well-being of CSOs. | High quality 9/11 |
| 3 | Mueser , Glynn (42) | 2009 US | Exploring client and family characteristics related to engagement and exposure to the interventions | A pilot RCT | N= 216 families (108 clients with concurrent substance use psychiatric disorders and their 108 key relatives | Selected subscales from the FEIS (Tessler&Gam ache, 1996). The Timeline Follow-back Calendar (TLFBC) assessed substance use during last 6 months. | Engaging and not engaging was influenced by: Geographical location ($\chi^2 = 7.61,$ $df=1, p < .01$), ethnicity ($\chi^2 = 7.61,$ $df=1, p < .03$), patient alcohol use problems ($\chi^2 = 7.61, df=1, p < .03$), relative close relationships ($\chi^2 = 7.61,$ $df=1, p < .004$), and relative stigmatizing attitudes ($\chi^2 = 7.61,$ $df=1, p < .007$). | 9/11 High quality |
| 4 | Drumm ond, Gilburt (40) | 2016 UK | Testing the feasibility of assertive community treatment and evaluating the efficacy of the intervention on drinking behaviours | A pilot RCT | N= 94 participan ts with age 18 years or over from communit y addiction services | Mean drinking per day and percent days of abstinence assessed by TimeLine Flow Form 90 Total alcohol and other drugs consumed in 6 months' health-related quality of life | Participants assigned to ACT were in contact with services for longer period ($t(76.77) = 15.62, P < 0.001$); received a greater mean service contact (t ($57.75) = 10.52, P < 0.001$). At 6 months, treatment as usual group had better significantly fewer alcohol- related problems and health utility. No significant difference between intervention and control groups in motivation for readiness to change, | High quality 9/11 |
| 5 | Guerrero, Fenwick (39) | 2015 US | Examined the extent to which coordinated care is the mechanism by which program capacity is associated with the waittime and retention. | Retrospecti ve cohort study | N=13,478 client treatment episodes were drawn from programs client dataset collected | Retention was measured as the number of days between admission and discharge dates | The relationship between high- capacity programs and client retention in treatment would be moderated by client minority status. African American clients had significantly greater retention in treatment than White. Medi-Cal eligibility and homelessness were positively associated with retention. | Accepta ble quality 6/12 |

| | | | | | | | | |
|----|--------------------------|----------------|--|---|---|--|--|----------------------------|
| 6 | Holtyn, Koffarnus (38) | 2014 US | To determine if employment-based reinforcement can increase retention in outpatient methadone treatment | RCT | in 2010 and 2011 participants on waiting lists for methadone treatment in Baltimore. | Addiction Severity Index-Lite and Cocaine sections of the Composite International Diagnostic Interview—2nd edition to assess drug dependence. | The Abstinence, Methadone, & Work Reinforcement condition differed significantly from the Work Reinforcement condition. At the follow-up, there were no between-condition differences in rates of drug abstinence. | 9/11 Higher quality |
| 7 | Morse and MacMaster (29) | 2015 US | To describe possible differences between young adult and older adult opiate users in abstinence-based, residential, dual diagnosis treatment | Retrospective study | N=760 individuals who reported using heroin, non-prescribed methadone, and/or other opiates during the 30 days prior to treatment | Addiction severity Items measuring the types and frequencies of service drawn from the treatment service review | At 6 months follow up, opiate users had lower rates of treatment completion at every other weekly measure, peaking at 3 weeks (77.5% vs. 81.1%, $p \leq .001$). Opiate users had a shorter average length of stay by almost two days (30.9 vs. 32.8 days, $t \frac{1}{4} .204$, $p \leq .041$). Young and older adults continued to have higher scores for drug use and medical issues respectively. No differences between group regarding the use of outpatient and halfway house and engagement in 12 steps programs | Acceptable quality 6/12 |
| 8 | Courtney, Clare (41) | 2017 Australia | Describe the retention rates in the financial interventions for smoking cessation among low-income smokers. Identify if smoking-related, health-related, behavioural, socio-demographic characteristics were associated with retention | RCT open-labelled with allocation concealment | N= 1047 Low-Social Economic Status smokers interested in quitting smoking | The self-reported data collected via CATI included: smoking-related, substance use, mental or physical health, general psychological factors, socio-demographics, and recruitment source | Motivation to quit was significantly associated with both 2-month and 8-month retention (OR: 1.16; 95% CI: 1.03, 1.30, $p < 0.05$; and 1.15; 95% CI: 1.04, 1.27, $p < 0.01$ respectively). Having older age significantly predicted program completion at 2 and 8 months. An increase in level of education significantly contributed to retention in the 8 months' interview. | High quality 10/11 |
| 9 | Kim, Saitz (33) | 2011 US | To examine the proportion of study participants that initiated and engaged with Chronic Disease Model addiction care. | A prospective cohort study with a 3-month follow-up | N=282 individuals with alcohol dependence, drug dependence, or both alcohol and drug dependence | Initiation and engagement measured by two or three to patients' visits to addiction care services within 30 days of initiation | Participants who engaged with CDM services utilized addiction treatment (79% vs 56%, P -value = 0.001) and addiction pharmacotherapy (39% vs 18%, P value < 0.001). Female sex was associated with lower odds of linkage with CDM care over the course of the study | Acceptable quality 8/12 |
| 10 | Cao et al. (2014) | 2014 China | To identify various predictors of treatment retention over a six-year period. | The prospective predictive study extended over a 6 year-period. | N=1511, 18 years or older drug users who have failed to come off heroin use | Retention duration represents days on treatment from the first dose to the last dose of methadone or last date of the study period. | Clients reporting close or average family relationships in the month prior to MMT enrolment were significantly associated with retention. Daily dosages of methadone were strongly correlated with retention in treatment (20.8% for ≤ 30 mg/day vs 34.8% for 31–60 mg/day vs 53.2% for >60 mg/day, $p < 0.0001$). | Acceptable quality 8/12 |

| | | | | | | | | |
|----|--|---------------|---|-------------------------------|---|---|--|--------------------|
| 11 | Graff, Morgan (52) | 2009 US | Compared rates of engagement and retention of alcohol-dependent women and women in couple treatment; | RCT | 102 women seeking outpatient treatment for alcohol problems and their male spouse or partner | The TLFB41 was used to assess alcohol and drug use for both the woman and her partner in the three months prior to the baseline interview. Motivation was measured by readiness to Change Questionnaire | Women in the individual treatment condition attended significantly more sessions than women in the couples' condition ($t(100) = -1.98; p = .05$). Being older, having no children at home were associated with fewer alcohol dependence symptoms, later age of onset of an alcohol diagnosis, more satisfying marital relationships, and having encouraged or accepting partners increased treatment engagement ($F(4, 86) = 5.48, p < .001$). Women's age, the total number of current alcohol dependence symptoms, female relationship quality score, spouse drinking status, and women's condition preference accounted for 40% of variations in retention outcomes ($F(5, 72) = 9.39, p < .001$). | 9/11 High quality |
| 12 | Stevens, Verdejo - García, Roeyers, Goudriaan, and Van der Plas (2015) | Belgium, 2015 | To examine whether delay discounting, as measured shortly following treatment entry, would be predictive of shorter treatment retention | Quasi-experimental design | N= 84 Substance drug injecting | The motivation for treatment was measured using a Dutch version of the The motivation for Treatment (MFT) scale | A delay discounting significantly predicted shorter treatment retention ($t(82) = -3.04, p < .02$). The associated b-value (-4.50) indicated that as the ln(k)-value decreased by one unit treatment, retention increased by 4.50 units (i.e., days). | 9/11 High quality |
| 13 | Becan, Knight, Crawley, Joe, and Flynn (2015) | US 2015 | To test the effectiveness of a new intervention for improving motivation for change, the Treatment Readiness and Induction Program | Comparative descriptive study | 519 aged 12 and older recruited from 6 residential programs | The treatment motivation scales | Higher problem recognition [$t(507) = 13.72, p < 0.0002$], and desire for help [$t(507) = 7.28, p < 0.008$] in the intervention than in the control group at follow-up. | 9/11 High quality |
| 14 | Ng and Harerimana (2016) | 2016 Rwanda | Evaluate a sustainable model of mental health care in a low-income country | Prospective cohort study | 719 patients who sought care for substance use and posttraumatic stress disorders between 2013 - 2014 | Retention was determined by regular attendance to follow-up appointments | Factors associated with improved treatment outcomes included: patients presenting for care with their families (85.63%) and patients' beliefs regarding treatment was helpfulness, importance, and/or necessity as reported by 90.26%. | 8/12 Acceptable |
| 15 | Mason et al. (2016) | 2016 US | Tested a 20-minute intervention that integrates motivational interviewing and peer network strategies | RCT | 119 participants recruited from an adolescent medicine outpatient clinic | The number of days they have used substances within the last month with self-reported alcohol use and self-reported marijuana use | The reduction of alcohol offers for the intervention condition suggests that alcohol use behaviour may be closely associated with adolescents' peer network characteristics of risk or protection, at least for boys as we did not find this effect for girls. | 10/11 High quality |
| 16 | Tate et al. (2011) | 2011 US | Evaluate predisposing, enabling, and need predictors of treatment retention | Randomized clinical trial | 253 participants entering outpatient treatment at the Veterans Affairs San Diego | The motivation was assessed via ASI questions asking the importance of treatment and abstinence | Participants with low social support attended more sessions than participants with high social support. Participants who experienced an acute health event in the three months prior to treatment attended more sessions than participants without an acute pre-treatment health event. | 9/11 High quality |

Healthcar
e System

Study characteristics

Included articles were reporting on research conducted in eight countries: Australia, Belgium, Canada, China, Germany, Rwanda, and the United Kingdom had one article each; whereas nine articles were from the United States of America. In terms of methods, the majority of reviewed research articles, nine (56.2%), were studies that utilized an experimental design, of which eight were randomized control trials (RCTs) and one was quasi-experimental design. Five (31.3%) studies used a longitudinal design, three of which were prospective cohort studies, while two were retrospective. There was also one (6.2%) comparative descriptive and one (6.2%) cross-sectional study in the reviewed articles.

The reviewed studies sampled from three types of population: community-residing population (4 (25.0%)), inpatients (7 (43.8%)), and outpatients (5 (31.2%)). With regard to sample size, reviewed studies accounted for a combined total of 104,710 participants. Because sample size varied across studies, they were broken into three categories, studies with small ($n < 200$), medium (200–499), and large ($n = 500$ and over) sample size. Accordingly, five studies (31.2%) had between 84 and 102 participants, three (18.8%) with a sample ranging from 216 to 300, while the remaining eight (50.0%) had more than 500 participants each. The majority of studies, 11 (69%) were published in the past five years, while five (31%) had a date of publication ranging between 2006 and 2011. Using CASP checklists to assess the quality of evidence, 10 of 16 (61%) reviewed studies scored ≥ 9 out of 11, which falls in the category of high quality. For the remainder, four (22%) studies scored between 7 and 8, a score in the category of acceptable quality and only two (19%) studies were rated at ≤ 6 out of 11, a score that falls into the low-quality category.

Empirical definitions for motivation and retention in the addiction recovery process

Motivation

In the included studies, addiction care outcomes, motivation for engagement and retention in the addiction recovery process were operationalized using a wide range of dimensions.

Examples include problem recognition, desire for help, and treatment readiness. Tate et al.,[27] study operationalized motivation for engagement by the people's perceived importance of treatment for their alcohol, drug, and psychological problems. Other empirical definitions of motivation were either the person's readiness for behaviour change measured by addiction severity index scale,[28, 29] or a combination of more than one of the following

dimensions: problem recognition, desire for help, and treatment readiness.[30, 31] These empirical definitions were also corroborated by Wild, Cunningham, and Ryan,[32] who assessed motivation for engagement in treatment through social network pressure, perceived costs and benefits associated with reducing alcohol and other drug use.

Motivation was also operationalized by commitment to attending addiction care programs. Other studies operationalized motivation by empirical definitions which, in clinical practice, are not uniquely specific to the person's engagement; for example, operationalizing motivation for engagement as two- or three person's visits to addiction care services within 30 days of treatment initiation.[33] Likewise, Bischof et al.[34] assessed the person's engagement using unspecific measures such as the utilization of available community services for alcohol problems and specialized addiction care settings.

Retention in the addiction recovery process

The operationalization of retention in the addiction recovery process used various measures across all included studies. In some studies, retention was defined as number of substance use during the last 30 days or compliance with a treatment plan. Mason et al.[34] assessed retention through self-reported numbers of days a person used substances, such as alcohol, cannabis, during the last month[35]; while in the Ng and Harerimana's study,[36] retention was determined by attendance to scheduled follow-up appointments. Retention was also operationalized as a period representing days on treatment from the first dose to the last dose of methadone or last date of the study period.[37]

Other operational definitions of retention include reduction in substance use and improvement in the patient's physical, psychosocial, and legal status. This empirical definition is supported by items of the Addiction Severity Index Scale, which assess the retention through reduced drug use, a person's stability in education, employment, relationships with family, along with improved medical and legal histories.[38] Additionally, Guerrero et al. empirically defined retention as the person's days of stay in treatment from admission to discharge dates[39]; whereas Drummond et al. [40] operationalized retention by reduced daily drinking mean, percentage of days patients abstain from substance, along with total amount of alcohol and other drugs used over a period of six months.

Factors influencing the patients' motivation and retention in the addiction recovery process

Motivation -enhancing healthcare structures and therapeutic relationships

The reviewed studies highlighted that healthcare structures, including addiction treatment tailored to the patient's needs, timely positive reinforcement and understanding of the needs, enhanced patient-healthcare professional relationships, and readily accessible addiction care services, are vital for motivation and retention in addiction recovery.

Addiction treatment tailored to the patient's needs

The reviewed studies have linked, at various levels, the daily dosage of substitute treatment to patients' motivation and retention in the addiction recovery process. Over six years, a prospective predictive study demonstrated that daily dosage of methadone significantly correlated with treatment retention; specifically, among patients having methadone 30 mg/day the treatment retention was 20.8% as compared to 34.8% in the group with 31–60 mg/day and 53.2% for >60 mg/day, $p < 0.001$. [37]. Beside daily methadone dosage, another study found that patients who reported a positive relationship with their family relatives and contact with ex-drug users a month before entering treatment had significantly improved treatment retention ($p < 0.01$) [24].

Timely positive reinforcement and understanding of patients' needs

An experimental study examined the relationship between retention in addiction treatment and patient's satisfaction in the form of reward discounting. [31] The study found a positive effect of timely reward on retention in treatment ($t(82) = -3.04$, $p < 0.02$) wherein a reduction of one unit in a delay of reward increased treatment retention by 4.5 days ($\beta = -4.50$, $p < 0.01$). The study emphasised the importance of timely positive reinforcement and understanding of patients' needs on the course of the addiction recovery process. Similarly, implementation of motivation-enhancing interventions, combining mapping-enhanced counselling, experiential games, and activities to peer facilitation may enable a person to maintain higher scores on motivation domains until aftercare follow-up. This was ascertained in a sample of 519 patients from the United States with SUDs. [30] The study indicated a higher problem recognition [$t(507) = 13.72$, $p < 0.002$], and desire for help [$t(507) = 7.28$, $p < 0.008$] in the intervention than in the control group at follow-up. [30] However, this study

examined only two of four dimensions of motivation for engagement in treatment. As result, its findings cannot be inferred to the entire picture of retention in the addiction recovery process.

Enhanced patient and healthcare professional relationships

Addiction care outcomes may be improved by treatment interventions delivered through community assertiveness treatment (CAT); which emphasize addiction recovery principles, including enhanced patient and healthcare professional contacts, relationships, and care planning based on patient's goals, health and social needs such as accommodation, leisure, occupation and physical and mental health. [40] A randomized control trial by Drummond et al., [40] indicated that participants assigned to CAT plus treatment, as usual, were in contact with services for longer period ($t(76.77) = 15.62$, $P < 0.001$); and they also received a greater mean service contact ($t(57.75) = 10.52$, $P < 0.001$). [40] Although, at six months the intervention group had significantly fewer alcohol-related problems and health utility, there was no significant difference between intervention and control groups in motivation for readiness to change, health-related quality of life, and severity of dependence. [40] It is also worth noting that the study neither distinguished the contribution of each extrinsic factor nor evaluated other domains of the person's motivation for engagement in the addiction recovery process; i.e., problem recognition, desire for help, and pressure for treatment.

Readily accessible addiction care services and patient-tailored treatment

Motivation may be enhanced by interactions between retention in addiction care and health care setting's capacity in terms of program readiness to implement new practice minimising the patients' wait time to enter treatment and maximizing retention. [39] A retrospective study among Americans found that having a health care insurance and being homeless had a positive association with retention in addiction treatment. [39] Similar to the other reviewed articles, Guerrero et al., [39] provided little evidence on which motivation domains that influenced retention variables.

Another study indicated that combining substitute treatment delivered through individually determined doses of methadone and work reinforcement conditions has the potential to enhance abstinence among patients with substance problems. [38] The randomized control trial by

Holtyn et al.[38] sought to determine if an intervention which focuses on employment-based incentives can enhance outcomes among 98 American patients in a methadone treatment program. The study found that patients in intervention exhibited a higher proportion of urine clean from opioids (75% versus 54%) and cocaine (57% versus 32%) than the control.[38] However, the results of follow-up data showed no significant differences in abstinence rates between the groups. Such inconsistent findings indicate that addiction care outcomes may be subject to extrinsic factors outside treatment conditions such as supportive social networks; which were not taken into account by the study.

Supportive social networks

The studies reviewed failed to provide consistent evidence on the association between supportive social networks and improved retention in addiction care. However, several studies linked specific social supports with positive addiction treatment outcomes.

Support from family relatives

In a one-year research on post-traumatic stress disorders and SUDs treatment, Ng and Harerimana,[36] highlighted the role of acknowledging people's beliefs about treatment and family involvement in improving retention outcomes. The research found a retention rate of 55.6% and attrition rate of 37.1% at one-year follow-up.[36] People who optimally benefited from the care program had family support in the form of accompaniment (85.6%), and believed that treatment was helpful, relevant, and/or necessary (90.2%).[36] Nonetheless, family relatives and peer network may compromise motivation outcomes by exerting pressure for treatment on the patient. A Canadian study examined the extent to which patient motivation, extrinsic motivation in the form of subjective social network pressure to seek addiction care, influenced motivation for engagement and retention among 300 adults seeking treatment.[32] In this study, Wild, Cunningham [32] found that perceived coercion through network pressure negatively impacted the patient's identified motivation ($r = -.34$, $p < .001$), and had a negative correlation with alcohol dependence ($r = -.22$, $p < .01$).

In contrast to the previous studies, several similar studies have shown inconsistent results. Bischof, Iwen[34], in a German RCT, used a sample of 94 people entering treatment for alcohol use disorders to examine their engagement in an intervention aimed at improving close relative functioning. This

RCT found inconsistent effects on the people's engagement at three, six, and twelve-month follow-up periods. At three months, rates of engagement among participants assigned to the intervention group were significantly higher than in the control group (40.5% vs 13.9%, $p < 0.02$).[34] However, the difference between groups was not significant at six and twelve months' follow-up, 47.6% vs 41.7%, $p < 0.84$.[34] Despite the inconsistency in results after three, six- and twelve-months' follow-ups, this RCT does provide insights into the potential of involving people's social networks, mainly close relatives in addiction treatment.

Peer support

A six-month RCT of 119 adolescents with alcohol and cannabis use problems, in the United States, compared peer network-led intervention, promotion of motivation through rapport, acceptance, reflections, and non-confrontation with standardized addiction treatment protocols.[35] The study found marginally significant positive peer network intervention outcomes only in alcohol use via reduced social stress ($R^2 = 0.05$, $p = 0.052$).[35] The concern, in this study, was that the RCT measured the construct social support using only two items, loneliness and perceived isolation, rather than the full construct scale; thus, potentially negatively impacting the comprehensiveness of the data. In contrast to the preceding study, in another RCT involving 253 American participants with major depression and SUDs entering outpatient treatment, Tate, Mrnak-Meyer [27] found diametrically opposed results regarding supportive social networks.[27] This study, examining predictors for treatment retention, indicated that participants with low social support were more active in treatment than those with higher support.

The person's characteristics moderating the effect of extrinsic factors on motivation and retention in the addiction recovery

Characteristics of a person, such as having an intimate relationship or dependents, the age of substance use onset, and age at the current episode can influence motivation for engagement and retention in the addiction recovery process.[28] This influence was evidenced in an RCT, which examined specific factors for treatment engagement and retention among 102 American women who were assigned to cognitive behavioural therapy for substance use problems.[28] The RCT found that being older and having no dependents predicted fewer alcohol dependence symptoms; while later substance use onset, having more satisfactory marriage status, and living with an encouraging and accepting spouse correlated with higher

engagement in addiction care intervention ($F(4, 86) = 5.48, p < .001$).[28] Courtney, Clare [41], in an RCT testing an intervention for smoking cessation among 1047 Australians, indicated similar interactions between socio-demographic characteristics and retention in addiction care. The researchers found that being older significantly predicted program completion at two and eight months ($OR = 1.04; 95\% CI: 1.02, 1.06, p < 0.01$ and $OR = 1.05; 95\% CI: 1.03, 1.07, p < 0.01$ respectively).[41] This study further showed that a higher level of education also had a significant effect on retention at the eight months' follow-up interview ($OR = 2.24; 95\% CI: 1.45, 3.46, p < 0.01$).

Another RCT study by Mueser, Glynn [42] evaluated the influence of patient and family characteristics on engagement in addiction treatment. Mueser, Glynn [42] showed that the patients' engagement was influenced by these characteristics, including geographical location ($\chi^2 = 7.61, df=1, p < .01$), ethnicity ($\chi^2 = 7.61, df=1, p < .03$), patient SUD ($\chi^2 = 7.61, df=1, p < .03$), having close relationships ($\chi^2 = 7.61, df=1, p < .004$), and relatives' stigmatizing attitudes ($\chi^2 = 7.61, df=1, p < .007$), which all had a statistical significant effect on engagement outcomes.[42]

Other person's characteristics that have potential to affect addiction recovery include being female, which correlated with reduced odds ratio of engagement in addiction care (Adjusted $HR = 0.67, 95\% CI: 0.49, 0.90$).[33] Likewise, Morse and MacMaster evaluated the influence of patients' characteristics in a retrospective study among 760 Americans entering treatment for heroin, non-prescribed methadone, and/or other opioids. The study found that patients using opioids had lower rates of treatment completion, i.e. 77.5% vs 81.1%, $p \leq .001$ among those not using opioids.[29] Additionally, results demonstrated that being a young adult (18–25 years old) was associated with a higher score on drug use and involvement in legal issues; whereas, there was no difference among groups in terms of receiving addiction care from either outpatient or halfway house and 12 step programs.[29]

DISCUSSION

The primary purpose of this systematic literature review was to summarize empirical evidence pertaining to extrinsic factors for the person's motivation for engagement and retention in the addiction recovery process. The reviewed evidence concludes that a person's motivation for engagement and retention in the addiction recovery process is, to a varied extent, influenced by several

extrinsic factors. Key factors were addiction care programs and therapeutic relationships capable of enhancing the person's perceived experiences with treatment. Such addiction care programs may consider to: (1) timely respond to each person's needs and interventions targeting to improve the person's experiences with the addiction care recovery process;[30,31] (2) comprehensive addiction care programs providing biological treatment and social interventions that improve relations between people receiving care and their family relatives[37,38,40], along with ensuring that each person has a single and stable care provider throughout the treatment process[37, 40]; and (3) to maximize daily dosage of maintenance treatment (e.g. methadone $>30/day$) in accordance to each individual response to medication.[37, 38] The present review also highlights that addiction care programs are required to minimize the wait time for receiving treatment.[39] Offering programs that can provide the person with addiction care without long wait time is particularly important because this can help with alleviating the person's addiction-related difficulties, such as a reduced capacity of decision making and impulse control.[43-45]

Other important extrinsic factors to consider while formulating addiction care programs include psychosocial processes, such as companionship by person's relatives that may contribute to fostering social support and reduce the stress associated with SUDs.[36] The review also indicates that people seeking addiction care due to their own motivation may have better treatment outcomes than those who are pressured by their social networks.[32] Understanding this difference may enable healthcare providers to pay attention to the person's motivation for seeking care; and subsequently, make clinical decisions accordingly.

Furthermore, the review indicates that the person's characteristics may play a crucial role in moderating the interactions between extrinsic factors and motivation and retention outcomes. In the process of clinical decision making, addiction care program managers and healthcare providers should not overlook the potential impact of a person's characteristics on motivation, retention in treatment, and subsequent health outcomes. These characteristics include being in intimate relationship, having dependents, age of substance use onset, age at current episode, level of education[28, 41] as well as type of substance misused[29], the person's geographic location and suffered stigmatization attitudes from family relatives.[46]

This literature review also sought to evaluate empirical definitions used to assess variables related to motivation for engagement and retention in the addiction recovery process. Variable related to motivation for engagement in addiction care was evaluated by diverse domains, including the person's readiness for behaviour change, problem recognition, social network pressure, perceived costs and benefits associated with reducing alcohol and other drug use, and visits to addiction care services within 30 days of treatment initiation. Although no studies combined these empirical dimensions for variables related to motivation, the review results support indicators developed and validated through the Texas Christian University Motivation Scale.[20,47] The scale operationalizes motivation for addiction care as a combination of problem recognition, desire for help, treatment readiness, pressures for treatment, and treatment needs.[20,47]

Outcomes related to retention in addiction recovery were operationalized by variable person's aspects including: regular attendance to follow-up appointments, days spent in treatment from the first dose to the last dose, commitment to reducing drug use, the person's stability in education, employment, relationship with family, along with improved medical and legal histories. To a certain extent, these domains for retention in the addiction recovery are consistent to those developed and validated by standard gold instruments, such as the Scale for Substance Use Recovery Evaluator, and the addiction recovery process.[48-51], demonstrated that the process of addiction recovery might be observed by the past week-based improvement in the person's domains, including reduced drinking and drug use, self-care, relationships, perceived importance of abstinence from drinking and drug use, looking after oneself, stable resources and belongings. Furthermore, this review identified inconsistent results, especially in studies that tested the influence of psychosocial interventions on engagement or retention in addiction care. This inconsistency may be partially explained by differing empirical definitions for these variables across reviewed studies. As such, further studies are needed to address this limitation of the current literature.

Strengths and Limitations

To our knowledge, this is the first literature review to evaluate various empirical definitions for motivation for engagement and retention in the addiction recovery process, to provide a systematic synthesis of evidence on extrinsic factors influencing these treatment outcome variables. Another

strength of this systematic review is based on the characteristics of the included studies. The majority (50%) used experimental designs, 72.5% were published in the last five years, and reviewed studies accounted for 218,010 participants. Of 16 included studies, ten independently sampled over 500 participants.

However, this systematic review has a few limitations, such as having summarized evidence from studies with diverse methodologies. The fact that the majority of included studies have been conducted in the US may constitute a contextual limitation for the review results.

CONCLUSIONS

This systematic review provides healthcare providers, addiction care service administrators, and policymakers with valuable insights, such as empirical dimensions that can facilitate the interpretation of information collected from a person with SUDs; and thereby advance addiction care planning and outcomes. The review results may assist mental health professionals in the process of information collection and interpretation, as well as clinical judgement, along with the formulation of interventions that address unique person's needs for addiction care. To that end, the review elucidated empirical definitions used to assess motivation for engagement, including problem recognition, desire for help, treatment readiness, and commitment to attending addiction care programs. Identified empirical definitions for retention in the addiction recovery, included the number of substance use during the last 30 days or compliance with treatment plan and reduction in substance use, along with improvement in the patient's physical, psychosocial, and legal status. The review indicates important factors to consider when improving addiction care, such as addiction treatment tailored to patient's needs, timely positive reinforcement and understanding of patients' needs, addiction care systems providing timely access to addiction care and patient tailored treatment, as well as supportive social networks. This review demonstrates a knowledge gap as a result of inconsistent results and lack of evidence explaining mechanisms by which therapeutic relationships and supportive social networks influence the person's motivation for engagement in the addiction recovery process. The review, further, indicates a lack of studies that used measures with full empirical dimensions to examine the influence of extrinsic factors on the person's motivation in the combined model.

Funding information

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Acknowledgement

Authors express thanks to Elizabeth Muchiri for her contribution to the selection of reviewed studies and their quality appraisal.

Conflict of interest

The authors have no conflict of interest to declare.

Authors' Contribution

BH conceived the review, conducted study selection and their quality appraisal, and drafted the articles. C F, RC, MK critically revised the importance and intellectual content of the article. All authors approved the final version of the article.

This article is published open access under the Creative Commons Attribution-Non-Commercial No Derivatives (CC BYNC-ND4.0). People can copy and redistribute the article only for noncommercial purposes and as long as they give appropriate credit to the authors. They cannot distribute any modified material obtained by remixing, transforming or building upon this article. See <https://creativecommons.org/licenses/by-nc-nd/4.0/>

REFERENCES

1. Gowing LR, Ali RL, Allsop S, Marsden J, Turf EE, West R, et al. Global statistics on addictive behaviours: 2014 status report. *Addiction*. 2015;110(6):904-19.
2. United Nations Office on Drugs and Crime. Global overview of drug demand and supply. Latest trends and cross-cutting issues. *World drug report 2017*. Austria: United Nations publication;2017
3. Whiteford HA, Ferrari AJ, Degenhardt L, Feigin V, Vos T. The global burden of mental, neurological and substance use disorders: an analysis from the Global Burden of Disease Study 2010. *PloS one*. 2015;10(2):e0116820.
4. Staton-Tindall M, Havens JR, Oser CB, Burnett MC. Substance use prevalence in criminal justice settings. *Handbook of evidence-based substance abuse treatment in criminal justice settings*; Springer; 2011. p. 81-101.
5. United Nations Office on Drugs and Crime. *World drug report*. Vienna: United Nations; 2018.
6. The New Time Rwanda. Drug abuse, trafficking cases on the rise.

- <http://www.newtimes.co.rw/section/article/2017-01-18/207198/> (2018). Accessed 10 Jan 2018.
7. Boyce J, Cotter A, Perreault S. Police-reported crime statistics in Canada, 2013. *Juristat: Canadian Centre for Justice Statistics*. 2014:1.
 8. Dauvergne M. Trends in police-reported drug offences in Canada. *Juristat: Canadian Centre for Justice Statistics*. 2009;29(2):1C.
 9. Guimarães RA, Mesquita NS, Lopes RS, Lucchese R, Felipe RLd, Vera I, et al. Prevalence and factors associated with criminal behavior among illicit drug users: a cross-sectional study. *Substance use & Misuse*. 2017;52(11):1393-9.
 10. United Nations. *Action plan for the implementation of the declaration on the guiding principles of drug demand reduction, annex to resolution, General Assembly*. United Nations, New York. 2000;[A/RES/54/132A/RES/54/132](https://www.un.org/News/Press/docs/2000/0004/0004132a.html).
 11. Carroll KM, Ball SA, Nich C, Martino S, Frankforter TL, Farentinos C, et al. Motivational interviewing to improve treatment engagement and outcome in individuals seeking treatment for substance abuse: A multisite effectiveness study. *Drug and Alcohol Dependence*. 2006;81(3):301-12.
 12. Hoseinie L, Gholami Z, Shadloo B, Mokri A, Amin-Esmaeili M, Rahimi-Movaghar A. Drop-out from a drug treatment clinic and associated reasons. *Eastern Mediterranean Health Journal*. 2017;23(3).
 13. Szafranski DD, Snead A, Allan NP, Gros DF, Killeen T, Flanagan J, et al. Integrated, exposure-based treatment for PTSD and comorbid substance use disorders: Predictors of treatment dropout. *Addictive Behaviors*. 2017;73:30-5.
 14. Cornelius JR, Maisto SA, Pollock NK, Martin CS, Salloum IM, Lynch KG, et al. Rapid relapse generally follows treatment for substance use disorders among adolescents. *Addictive Behaviors*. 2003;28(2):381-6.
 15. Deci EL, Ryan RM. Self-determination theory: A macrotheory of human motivation, development, and health. *Canadian Psychology/Psychologie Canadienne*. 2008;49(3):182.
 16. Ryan RM, Deci EL. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American psychologist*. 2000;55(1):68.
 17. Deci EL, Ryan RM. *Cognitive evaluation theory. Intrinsic motivation and self-determination in human behavior*. Boston: Springer; 1985. p. 43-85.
 18. De Leon G, Melnick G, Tims FM. The role of motivation and readiness in treatment and recovery. 2001.
 19. DiClemente CC, Schlundt D, Gemmell L. Readiness and stages of change in addiction

- treatment. *The American Journal on Addictions*. 2004;13(2):103-19.
20. Simpson DD, Joe GW. Motivation as a predictor of early dropout from drug abuse treatment. *Psychotherapy: Theory, Research, Practice, Training*. 1993;30(2):357.
21. Pedhazur EJ, Schmelkin LP. *Measurement, design, and analysis: An integrated approach*. Psychology Press; 2013.
22. Moher D, Shamseer L, Clarke M, Ghersi D, Liberati A, Petticrew M, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic Reviews*. 2015;4(1):1.
23. Richardson WS, Wilson MC, Nishikawa J, Hayward RS. The well-built clinical question: a key to evidence-based decisions. *Acp j club*. 1995;123(3):A12-3.
24. Critical Appraisal Skills Programme. CASP Cohort study checklist. <http://creativecommons.org/licenses/by-nc-sa/3.0/> www.casp-uk.net (2017). Accessed 15 Dec 2017.
25. Critical Appraisal Skills Programme. CASP Randomised controlled trials checklist. <http://creativecommons.org/licenses/by-nc-sa/3.0/> www.casp-uk.net (2017). Accessed 15 Dec 2017.
26. Critical Appraisal Skills Programme. CASP Evaluate a clinical prediction rule checklist [online]. Retrieved from visit <http://creativecommons.org/licenses/by-nc-sa/3.0/> www.casp-uk.net (2017). Accessed 15 Dec 2017.
27. Tate SR, Mrnak-Meyer J, Shriver CL, Atkinson JH, Robinson SK, Brown SA. Predictors of treatment retention for substance-dependent adults with co-occurring depression. *The American Journal on Addictions*. 2011;20(4):357-65.
28. Graff FS, Morgan TJ, Epstein EE, McCrady BS, Cook SM, Jensen NK, et al. Engagement and retention in outpatient alcoholism treatment for women. *American Journal on Addictions*. 2009;18(4):277-88.
29. Morse S, MacMaster S. Characteristics and outcomes of young adult opiate users receiving residential substance abuse treatment. *Journal of evidence-informed social work*. 2015;12(6):556-66.
30. Becan JE, Knight DK, Crawley RD, Joe GW, Flynn PM. Effectiveness of the Treatment Readiness and Induction Program for increasing adolescent motivation for change. *Journal of Substance Abuse Treatment*. 2015;50:38-49.
31. Stevens L, Verdejo-García A, Roeyers H, Goudriaan AE, Vanderplasschen W. Delay discounting, treatment motivation and treatment retention among substance-dependent individuals attending an inpatient detoxification program. *Journal of Substance Abuse Treatment*. 2015;49:58-64.
32. Wild TC, Cunningham JA, Ryan RM. Social pressure, coercion, and client engagement at treatment entry: A self-determination theory perspective. *Addictive Behaviors*. 2006;31(10):1858-72.
33. Kim TW, Saitz R, Cheng DM, Winter MR, Witas J, Samet JH. Initiation and engagement in chronic disease management care for substance dependence. *Drug and Alcohol Dependence*. 2011;115(1-2):80-6.
34. Bischof G, Iwen J, Freyer-Adam J, Rumpf H-J. Efficacy of the community reinforcement and family training for concerned significant others of treatment-refusing individuals with alcohol dependence: A randomized controlled trial. *Drug and Alcohol Dependence*. 2016;163:179-85.
35. Mason MJ, Sabo R, Zaharakis NM. Peer network counseling as brief treatment for urban adolescent heavy cannabis users. *Journal of Studies on Alcohol and Drugs*. 2016;78(1):152-7.
36. Ng L, Harerimana B. Mental health care in post-genocide Rwanda: evaluation of a program specializing in posttraumatic stress disorder and substance abuse. *Global Mental Health*. 2016;3.
37. Cao X, Wu Z, Rou K, Li L, Lin C, Wang C, et al. Retention and its predictors among methadone maintenance treatment clients in China: a six-year cohort study. *Drug and Alcohol Dependence*. 2014;145:87-93.
38. Holtyn AF, Koffarnus MN, DeFulio A, Sigurdsson SO, Strain EC, Schwartz RP, et al. The therapeutic workplace to promote treatment engagement and drug abstinence in out-of-treatment injection drug users: A randomized controlled trial. *Preventive Medicine*. 2014;68:62-70.
39. Guerrero EG, Fenwick K, Kong Y, Grella C, D'Aunno T. Paths to improving engagement among racial and ethnic minorities in addiction health services. *Substance Abuse Treatment, Prevention, and Policy*. 2015;10(1):40.
40. Drummond C, Gilbert H, Burns T, Copello A, Crawford M, Day E, et al. Assertive community treatment for people with alcohol dependence: a pilot randomized controlled trial. *Alcohol and Alcoholism*. 2016;52(2):234-41.
41. Courtney RJ, Clare P, Boland V, Martire KA, Bonevski B, Hall W, et al. Predictors of retention in a randomised trial of smoking cessation in low-socioeconomic status Australian smokers. *Addictive Behaviors*. 2017;64:13-20.
42. Mueser KT, Glynn SM, Cather C, Zarate R, Fox L, Feldman J, et al. Family intervention for co-occurring substance use and severe psychiatric

disorders: Participant characteristics and correlates of initial engagement and more extended exposure in a randomized controlled trial. *Addictive Behaviors*. 2009;34(10):867-77.

43. Bechara A. Decision making, impulse control and loss of willpower to resist drugs: a neurocognitive perspective. *Nature Neuroscience*. 2005;8(11):1458.

44. Everitt BJ, Robbins TW. Neural systems of reinforcement for drug addiction: from actions to habits to compulsion. *Nature Neuroscience*. 2005;8(11):1481.

45. Polimanti R, Kaufman J, Zhao H, Kranzler HR, Ursano RJ, Kessler RC, et al. A genome-wide gene-by-trauma interaction study of alcohol misuse in two independent cohorts identifies PRKG1 as a risk locus. *Molecular Psychiatry*. 2018;23(1):154.

46. Timko C, Below M, Schultz NR, Brief D, Cucciare MA. Patient and program factors that bridge the detoxification-treatment gap: A structured evidence review. *Journal of Substance Abuse Treatment*. 2015;52:31-9.

47. Joe GW, Broome KM, Rowan-Szal GA, Simpson DD. Measuring patient attributes and engagement in treatment. *Journal of Substance Abuse Treatment*. 2002;22(4):183-96.

48. Neale J, Finch E, Marsden J, Mitcheson L, Rose D, Strang J, et al. How should we measure addiction recovery? Analysis of service provider perspectives using online Delphi groups. *Drugs: Education, Prevention and Policy*. 2014;21(4):310-23.

49. Neale J, Vitoratou S, Finch E, Lennon P, Mitcheson L, Panebianco D, et al. Development and validation of 'SURE': A patient reported outcome measure (PROM) for recovery from drug and alcohol dependence. *Drug and Alcohol Dependence*. 2016;165:159-67.

50. Neale J, Tompkins C, Wheeler C, Finch E, Marsden J, Mitcheson L, et al. "You're all going to hate the word 'recovery' by the end of this": Service users' views of measuring addiction recovery. *Drugs: Education, Prevention and Policy*. 2015;22(1):26-34.

51. Prochaska JO, DiClemente CC. The transtheoretical approach. *Handbook of Psychotherapy Integration*. 2005;2:147-71.

52. Graff FS, Morgan TJ, Epstein EE, McCrady BS, Cook SM, Jensen NK, et al. Engagement and retention in outpatient alcoholism treatment for women. *The American Journal on Addictions*. 2009;18(4):277-88.