Evidence base for early intervention in psychosis services in rural areas: A critical review

Alastair Pipkin

Oxford Institute for Clinical Psychology Training and Research, University of Oxford & Oxford Health NHS Foundation Trust, Oxford, United Kingdom

Correspondence
Alastair Pipkin, Oxford Institute for Clinical Psychology Training and Research, University of Oxford & Oxford Health NHS Foundation Trust, Oxford, United Kingdom.
Email: alastair.pipkin@hmc.ox.ac.uk

Abstract
Aim: Early Intervention in Psychosis teams (EITs) are a growing entity internationally, yet they remain under-researched given challenges facing their delivery. Model adaptations include stand-alone services, a hub-and-spoke model with various bases and integrating specialist staff into existing mental health teams. The present critical review focuses on reviewing the evidence base for the delivery of EITs in rural areas, first pertaining to evidence for model adherence and second to clinically outcomes.

Method: A systematic literature search was undertaken, finding 53 papers of interest. Nine papers met the inclusion criteria. A critical appraisal tool was used to consider the quality of the evidence and a narrative review of their findings is presented.

Results: The five studies reporting clinical outcomes of rural EITs demonstrate positive outcomes of a hub-and-spoke and stand-alone EIT on reducing hospital admissions, psychotic symptoms and improving quality of life. One study directly comparing hub-and-spoke to stand-alone EIT found that hub-and-spoke EIT had more positive outcomes than a stand-alone service. Of the studies attempting to promote adherence to EIT model in rural areas, services show low overall adherence and report issues pertaining to funding and managerial support for practical barriers to implementation.

Conclusions: EIT services in rural areas may show similar positive outcomes to urban areas and adaptations to suit rural populations appear acceptable, such as using a hub-and-spoke model, though further research is required. Adherence to EIT service models in rural areas may be limited and training programmes to promote adherence benefit from managerial and financial support.

KEYWORDS
cognitive behavioural therapy for psychosis, early intervention in psychosis, early psychosis, rural mental health care

1 | INTRODUCTION

Healthcare in rural areas can face challenges in ensuring timely and accessible care, given diverse geographical regions (Buzza et al., 2011). This has particular considerations for the treatment of psychosis, where comprehensive biopsychosocial early intervention is shown to result in positive psychosocial outcomes (McGorry, Killackey, & Yung, 2008; Thirthalli, Reddy, Kare, Das, & Gangadhar, 2017). Early Intervention in Psychosis teams (EIT) are multi-disciplinary services which demonstrate positive clinical outcomes for those experiencing a first-episode of...
psychosis (Bird et al., 2010; Marshall & Rathbone, 2011). EITs offer prompt access to a range of psychological, social and medical interventions, including Cognitive Behavioural Therapy for Psychosis, family therapy, vocational training and support, and antipsychotic medication (Wyatt & Henter, 2001). They are established worldwide, including New Zealand, United States, throughout Europe and in China (eg, Nishida et al., 2016; Srihari et al., 2015). EITs have been established in rural areas across the world, including in the United Kingdom (Burbach, Grinter, & Bues, 2009), Australia (O’Kearney, Garland, Welch, Kanowski, & Fitzgerald, 2004), Greece (Mantas & Mavreas, 2012) and Canada (Cheng, Dewa, Langill, Fata, & Loong, 2014). Research has reported similarities in conceptualization and delivery of the EIT model across the world (McDaid, Park, Iemmi, Adelaja, & Knapp, 2016). Further research suggests that adherence to EIT model by consistent, timely delivery of the range of psychosocial and medical interventions, is linked to positive clinical outcomes (Fusar-Poli, McGorry, & Kane, 2017). What is less clear is how this translates to EITs in rural areas, where challenges to model adherence and timely access due to geographical locations exist (Thirthalli et al., 2017). The present review will explore this issue. Relevant EIT service models will first be considered.

1.1 | Models of EITs in rural areas

Research in health care in rural and remote areas has recently implied that standard outpatient community models of care may not meet the needs of non-urban populations (Mitton, Dionne, Masucci, Wong, & Law, 2011). Rural areas lack a single agreed upon definition in the literature due to differences in what constitutes a rural area internationally, for example, an average rural area likely being smaller in the United Kingdom than an average rural area in Australia. However, Wakerman (2004) purports that an average definition of a rural area across settings are where the average population lives more than 60 km from the nearest Primary Care facility. Rural areas are there large, often sparse geographical locations which hold particular challenges for delivering community services, such as standard outpatient clinics not being accessible and an increased travel burden for clinicians to see patients (Thirthalli et al., 2017). In line with this, recent research has begun to explore adapted EIT models for different geographical areas and distinct population groups. There are currently three main models. The “stand-alone” model consists of one full, comprehensive team who work assertively with one geographical area, most often urban areas (eg, Petersen et al., 2005). The “hub-and-spoke” model consists of a central “hub”, or base, where managers, administrators and some members may be based, but has various “spokes” around a large geographical region where specific team members may work from, mainly covering larger rural areas (Bostock & Britt, 2014). EITs may therefore have staff established across a wider geographical region. The third model is “specialist-within-generalist”, in which EIT members are based within a general mental health team, such as a Community Mental Health Team (CMHT), and function as a specialist pathway provision (Behan, Masterson, & Clarke, 2017).

Behan et al. (2017) reviewed studies directly comparing different models of EIT and found that the stand-alone EIT model may be more clinically effective and cost-effective, but may face significant practical barriers such as distance to service users which makes it less viable in rural areas. The review highlights that type of service model may be a key determinant of clinical outcomes, as rural areas may be better suited to models which adapt to the specific demands. What remains unclear is the current effectiveness and delivery of EITs in rural areas; a prior review will now be summarized.

1.2 | The existing evidence for rural EITs

Welch and Welch (2007) conducted a prior review of the evidence for rural EITs, finding three studies (O’Kearney et al., 2004; Tee, Ehmann, & MacEwan, 2003; Welch & Garland, 2000). Two of these studies only described the implementation of rural EIT services in Australia (Welch & Garland, 2000) and Canada (Tee et al., 2003). Both studies described establishing local networks with existing services to facilitate the identification and early treatment of first-episode psychosis, though did not report any clinical outcomes. O’Kearney et al.’s (2004) study presented the evaluation of the EIT described in Tee and colleagues’ (2003) study with regards to model adherence. It reported that model adherence was greatest where a diagnosis of psychosis was in place and they had been registered under the EIT programme. The review considered this early but limited evidence of the ability to adhere to EIT service protocols in a rural area, though concluded that rural EITs remained “underserved and under-researched” (Welch & Welch, 2007, p. 489). The review concluded with recommendations for further research to establish the clinical outcomes and required adaptations to rural EITs, such as increased partnerships with local services and different routes of access to care. Further research has since been published reporting the clinical outcomes of rural EITs and evaluating adherence to service model. The present review will therefore aim to provide a summary of this literature and an appraisal of its quality. O’Kearney et al.’s (2004) study will be included in the present review to enable consideration of the evidence base as a whole, both in reporting their outcomes and appraising its quality.

1.3 | Rationale for the present review

The present critical review aims to expand a prior review of the evidence base for effective delivery of EIT in rural areas (Welch & Welch, 2007) by including more recently published studies and utilizing a quality appraisal tool to consider the quality of the evidence (Critical Skills Appraisal Program, 2018a, 2018b). The present review will include studies for EITs in rural areas pertaining to both clinical outcomes and outcomes for services’ adherence of the EIT model, as research highlights that this is an important aspect of effectiveness (Behan et al., 2017). It will focus on global studies given the international nature of this
issue, though the implications of the diversity of the populations involved will be considered. The aim of the review is to answer the following questions:

1. What is the evidence base for the clinical effectiveness of EIT in rural or remote areas?
2. What is the evidence base regarding the adherence to the EIT service model in rural and remote areas?

A literature search will be undertaken, followed by a critical appraisal of the relevant studies. The implications will then be discussed.

2 | METHOD

A narrative review was conducted with the aim of capturing the available evidence of rural EITs and appraising their quality. The author conducted the search and reporting, the implications of which will be considered.

2.1 | Search terms

In line with expanding Welch and Welch’s (2007) original review, their search terms were utilized for publications from 2004 to present. This included variants of the clinical term “early intervention in psychosis” (including first-episode psychosis; prodrome psychosis; first-identification psychosis, and so on), geographical terms (rural; sparse population; remote; regional) and evidence terms (quantitative study; clinical outcomes; and so on). Dominant associated terms for “early intervention” and “psychosis” were used and altered per each database searched to ensure any alternate language was included. The definition of rural varies across countries which poses challenges for conceptualization, such as a rural area likely being considerably more remote in Australia than in the United Kingdom. Research also has no standardized definition of a rural area and measurements vary (Wakerman, 2004). For the purposes of gathering the available evidence of rural EITs to offer a summary and quality appraisal, as in Welch and Welch’s (2007) original review, rural was considered self-defined in line with the aim of capturing all available global evidence, though the issue of defining rural remains a limitation. Search terms were updated as the literature was explored, and definitions between papers were cross-checked for major discrepancies.

2.2 | Search method

The search was run in the databases PsycInfo, AMED, BNI, CINAHL, EMBASE, HBE, HMIC, Medline, PubMed, and Ovid. The reference lists of key reviews and recent publications from Early Intervention in Psychiatry were also scanned.

2.3 | Inclusion criteria

Studies published between 2004 to present were included. O’Kearney et al.’ (2004) paper from Welch and Welch’s (2007) review was included to enable oversight of the available evidence sourced and to allow its quality to be appraised. The review adopted a hierarchy of evidence where randomized controlled trials (RCTs) are the highest form of evidence, followed by cohort studies and case controls (Murad, Asi, Alsawas, & Alahdab, 2016). All types of research design were included. Papers included were any study using any research design pertaining to evaluation of an EIT within a rural area. Mixed urban/rural area papers were included where the rural aspect was noted, such as comparing a rural area to another directly or implementing an alternative service model to serve the fact that the majority of the area was rural.

2.4 | Exclusion criteria

Papers not written in English were excluded due to the constraints of time and resource. Poster presentations, grey literature and unpublished transcripts were not included. Papers simply describing the implementation or key issues without specifically reporting either clinical outcomes or measurement of adherence to service model were also excluded. Studies addressing a partly rural area but without separating the specific issues regarding the rural area were excluded, for example papers exploring a mixed urban/rural area where the rural part was not predominant nor explored directly by the research.

2.5 | Summary of search

The below flowchart (Diagram 1) outlines the process of the literature search. A total of 1071 unique publications were returned on the first search. The author screened the titles and abstracts of all papers, resulting in 53 papers being identified as relevant. All 53 relevant papers were read in full with nine papers being included using the above criterion. A summary of the final included papers can be found in Table 1.

2.6 | Critical appraisal tool

The critical appraisal tools provided by the Critical Skills Appraisal Program (2018a, 2018b) were used to guide the critical appraisal of the studies, specifically the case control and cohort study tools as per the design used in each individual study.

3 | RESULTS

The literature searches described produced a total of nine papers which met the inclusion criteria. The studies contained a mixture of
naturalistic cohort studies and case control studies comparing different service models. The highest level of evidence presented according to the hierarchy of evidence criteria were levels 2 (cohort studies) and 3 (case control studies). This reflected the need for naturalistic studies of established services and direct comparisons of existing services.

Five studies focused on evaluating clinical outcomes of rural EIT services, whereas four evaluated interventions aimed at improving adherence to the EIT model. The studies will therefore be grouped in line with the research questions; clinical effectiveness of EIT in rural areas (n = 5; see Table 1); adherence to the EIT model in rural areas (n = 4; see Table 2).

### 3.1 Studies evaluating user outcomes of the EIT model in rural areas

Full details of the individual studies can be found in Table 1. Two studies used retrospective case data to compare service models (Dodgson et al., 2008; Fowler et al., 2009); one was a cross-sectional case control study comparing two EIT service models (Cheng et al., 2014); and two were naturalistic service evaluations (Burbach et al., 2009; Mantas & Mavreas, 2012). Comparisons between studies are not possible due to different outcome measures being used, differences in geographical, population and health service factors and lack of reported specificity of what interventions are provided. However, four studies demonstrated positive clinical outcomes for hub-and-spoke EIT models. Two United Kingdom-based evaluation studies demonstrated positive outcomes for use of hub-and-spoke EIT (Burbach et al., 2009) with one demonstrating favourable outcomes over a standard community mental health team (Dodgson et al., 2008). An evaluation study in Greece further demonstrated positive outcomes for a hub-and-spoke model (Mantas & Mavreas, 2012). It is worth noting that all three studies used different outcome measures; the United Kingdom-based studies relied on hospital admission data whereas Mantas and Mavreas (2012) used the Positive and Negative Symptom Scale and General Assessment of Functioning Scale as well as relapse rates and hospital admissions.
| Study ID and Name | Setting and model | Country | Design | Participants (N) | Outcome | Implications | Limitations |
|------------------|-------------------|---------|--------|------------------|---------|--------------|-------------|
| 01 Dodgson et al. (2008) | Mixed urban/rural, hub-and-spoke, one team | United Kingdom | Retrospective case control design using a one-way between groups ANOVA. Compared number of hospital admissions and length of stay after 3 years and engagement with services after 1 year with the service. Confounding variable of atypical antipsychotic medication was measured. | Clients in EIT under age 36 (n = 75); CMHT clients who met criteria for EIT (n = 114) | The two groups were statistically different in their demographics. EIT sample showed significantly less hospital admissions at F (1.187) = 10.8, P < .001 and significantly shorter stays in hospital at F (1.187) = 5.8, P < .01, with EIT having a mean length of stay of 44.9 days (SD = 100.3) and CMHT clients having a mean length of stay of 96.7 (SD = 167.5). EIT clients were also statistically more likely to still be engaged with the service after 1 year at P < .05. | A hub-and-spoke model EIT may be clinically effective in a rural area, particularly around reducing hospital admission rates and promoting engagement with services. Use of the hub as central managerial support promotes fidelity to the EIT model. | No matching or controlling of sample and statistically they differed on demographics. Raters were not blind. Data came from service and from researchers. Lack of information of what interventions were delivered for each client. Confounding variables were not controlled for besides antipsychotic medication. |
| 02 Burbach et al. (2009) | Rural, hub-and-spoke, one team | United Kingdom | Cohort study using pre- and post-EIT intervention at one-year, measured relapse rate (increase in psychotic symptoms requiring hospital admission following remission) using descriptive statistics | Clients ages 13-35 (n = 89) | 17% relapse rate, reporting 15 incidents of relapse with an average length of stay of 38.4 days (median = 21 days). Describes successful implementation of hub-and-spoke model in rural area. | Utilizing the central hub of a hub-and-spoke model facilitates EIT model fidelity and successful implementation in a rural area. Such services may result in low relapse rates. | No description of specific interventions provided. No control for population or confounding variables. No comparison group. Data came from service evaluation so no blinding to delivery or assessing was possible. Outcome of relapse rate differs across papers. |
| 03 Fowler et al. (2009) | Mixed urban/rural, one Stand-alone EIT compared to one team of partial EIT | United Kingdom | Historical case control design to compare the clinical outcomes of three service models; CMHT; partial specialist-within- | CMHT clients (n = 82 - historical data only); partial EIT clients | Found that the full EIT cohort had higher rates of partial and full recovery over CMHT at x² = 24.5 P > .001; 52% full compared to 15% partial. | A comprehensive stand-alone EIT service may be clinically more effective than a partial EIT and a CMHT for first episode psychosis. | No control or matching for samples, significant differences in demographics found. |
### Table 1 (Continued)

| Study ID and Name | Setting and model | Country | Design | Participants (N) | Outcome | Implications | Limitations |
|-------------------|-------------------|---------|--------|------------------|---------|--------------|-------------|
| compared to one historical CMHT | generalist EIT (EIT staff integrated into a CMHT); and full EIT (stand-alone model). Compared inpatient admissions, vocational/education engagement, PANSS<sup>a</sup> and Quality of Life Scale scores. Symptom interviews conducted with partial and full EIT clients only. Defined "functional recovery" as being in work or education 16+ hours per week. A Chi-squared analysis and independent sample t-tests were used. | Greece | full EIT clients (n = 102) | Full EIT demonstrated less inpatient admissions than the CMHT at $t = -3.51$, $P = 0.001$, with only a third of the EIT population being admitted whereas 100% were of CMHT and partial EIT group were admitted. Full EIT were admitted average 45.1 days (SD = 113.8), partial EIT average 78.7 days (SD = 67.2) and CMHT spending 165.5 days (SD = 109). Only role functioning subscale significantly differed at $t = 6.06$, $P > .001$, with full showing higher scores (mean = 13.9, SD = 4.4) than partial (mean = 6.5, SD = 7.1). | This has implications for the commissioning of models other than full or hub-and-spoke in rural areas as they may be less effective. | No control for confounding variables. Difference data points available for each cohort, including full EIT having face-to-face assessments with research team whereas others did not. No blinding for delivery or raters. No details regarding specific interventions provided. |

**04 Mantas and Mavreas (2012)**

Rural, Hub-and-spoke, one team

Greece

Describes the implementation and evaluation of an EIT. Data is provided at 6-month follow-up for PANSS, General Assessment of Functioning, hospital admissions and length of stay, and relapse rate as defined by increase in psychotic symptoms requiring a hospital admission following remission. Descriptive statistics are provided.

Clients ages 16-51 (n = 45)

Found a reduction in PANSS from initial referral (mean = 87.6, SD = 8.9) to 6-month follow-up (mean = 64.7, SD = 11.9) and an improvement in GAF (initial mean = 33.9, SD = 6.5; 6-month follow-up mean = 68.5, SD = 6.1). The relapse rate within 6 months was 20%, with nine incidents of relapse. 82.2% of the sample required hospital admission after their initial referral with a mean length of stay of 16.4 days (SD = 15.9).

The hub-and-spoke model may be efficacious both clinically and in terms of flexibly integrating into existing mental health networks in a region.

No statistical significance provided. No control or comparison group. No blinding for delivery or assessment due to service evaluation design. May be cultural or service-related confounding variables as it is in Greece. Outcome of relapse rate differs across papers.
| Study ID and Name          | Setting and model                        | Country | Design                                                                 | Participants (N)                                      | Outcome                                                                 | Implications                                                                 | Limitations                                                                 |
|---------------------------|------------------------------------------|---------|------------------------------------------------------------------------|------------------------------------------------------|--------------------------------------------------------------------------|------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 05 Cheng et al. (2014)    | Rural, Hub-and-spoke, two teams          | Canada  | Cross-sectional design using Chi-square analysis; compared hub-and-spoke EIT to stand-alone EIT service. Data were collected over 3 years on general functioning in the community using the Multnomah Community Ability Scale, and service-collected data on admissions to hospital and length of stay within a 12 month period, and on emergency room visits within a 12 month period. | Clients receiving hub-and-spoke EIT (n = 77); clients receiving stand-alone EIT (n = 15) | The full EIT cohort had more admissions to hospital (70%) over the hub-and-spoke model (31.8%), which was statistically significant at $P > .05$. Functioning was higher in the hub-and-spoke model but this was not statistically significant. | The findings are inconclusive but suggest that a hub-and-spoke EIT may out-perform a full, stand-alone EIT service in rural areas. Further research comparing models of EIT in rural areas is needed. | No matching or control for sample, No confounding variables accounted for, No details of specific interventions provided, Formed part of larger research trial so may have less validity in terms of involvement of participants or services than general service evaluations, Does not specify whether researchers were blind or not, No details of adherence to EIT model described |

\(^a^\text{ANOVA, Analysis of variance.}

\(^b^\text{PANSS, Positive and Negative Symptom Scale.}
| Study ID and Name | Setting and model | Country | Design | Participants (N) | Outcome | Implications | Limitations |
|------------------|-------------------|---------|--------|------------------|---------|--------------|-------------|
| 06 O’Kearney et al. (2004) | Rural, Specialist-within-general team, three teams | Australia | Retrospective case note audit using pre-, post-design and regression analysis. Evaluated adherence to service model 2 years following Southern Area First Episode (SAFE) training programme and explored client predictive factors. Three independent raters reached consensus. Survey designed by research team on checklist criteria. | Clinicians (n = 66) Clients ages 15-25 (n = 224) | Difference in sensitivity to diagnosing psychosis across teams (P > .01). Teams varied on adherence to model, 16-37% adherence rate on CBT, psychoeducation, outcome measure use, physical health monitoring. Client registration under SAFE programme was largest predictor of adherence to EIT model \( \chi^2 \) change = .373, \( F [1,18] = 13.75, P < .1 \) controlling for age, gender, diagnosis, complexity and team. | The delivery of training appeared to facilitate adherence to delivery of EIT model in rural areas, though the adherence rates vary across teams and may be influenced by local structures and registration under the system. | Use of clinician self-report may be biased. No control or matching across different teams. Not generalisable due to only 25% of the caseload being accounted for. Some covariates used but other service-related, cultural and political factors may influence findings. |
| 07 Catts, Evans, Toole, et al. (2010) | Mixed Urban/Rural, Various service models, 60 teams | Australia | Cross-sectional design survey design using one-way ANOVA and regression analysis. Self-report survey sent to service directors designed by national expert committee to measure adherence to EIT model and service-related factors predicting overall implementation. | Service directors (n = 60) | Response rate was 61%. Rural areas reported lower available funding, and had significantly less overall implementation of the model at \( F (3,57) = 13.18, P < .0005 \). Available funding for EIT was the only predictive factor at \( B = 0.581, r^2 = 0.307, P = .003 \). | Rural EITs may have less funding which may be associated with less adherence to the service model in practice, which has implications for the delivery of evidence-based practice. Support for service providers and ring-fenced funding for rural areas may facilitate consistent implementation. | May be response bias in use of service lead self-report. No confirmation of actual service delivery. No control or measure of confounding variables. Geographical descriptor may not reflect reality of service issues. 39% did not respond which may influence results. |
| 08 Bedard, Nadin, Zufelt, and Cheng (2016) | Rural, Hub-and-spoke, 12 teams | Canada | Pre- and post-intervention case note audit using Chi-square analysis to evaluate the effect of Care paths training programme (O’Kearney et al., 2004) on best practice adherence after 1 year. An audit checklist was devised | Clients accessing 12 EITs (n = 108) | Only two aspects improved post-training: use of assessment of impact on family \( \chi^2 = 5.14, P = .02 \) and assessment of substance misuse \( \chi^2 = 4.13, P = .04 \). Feedback from services post-training identified a | Specifically-targeted training to support EIT staff to adhere to the service model may have some limited benefits. Service pressures including limited clinician time, the challenges of engaging clients and delivering | Use of audit tool is open to bias around reporting and lack of confirmation of practice. No blinding for raters. No measurement of confounding variables or control. |

(Continues)
| Study ID and Name | Setting and model | Country | Design | Participants (N) | Outcome | Implications | Limitations |
|------------------|------------------|---------|--------|-----------------|---------|--------------|-------------|
| O9 Durbin, Selick, Hierlihy, Moss, and Cheng (2016) | Mixed Urban/Rural, Mixed models, 52 teams (21 in rural catchment areas) | Canada | Cross-sectional survey design using Chi-square and t-test analysis. Measured adherence to national EIT service delivery standards, the available budget, full time equivalent (FTE) clinician availability, client caseloads and available system support. Separated services into large catchment areas (ie, greater than 100 000 population) or small (ie, rural, less than 100 000 population). | EIT service providers (n = 52) | Rural services reported lower total budget, less clinician FTE and less overall clients, though the same size clinician caseloads. Rural programmes reported less than half implementation of EIT programme standards overall, though only less access to psychiatry and physical health monitoring reached statistical significance at P = .01 and P = .02 respectively. Rural areas reported better access to vocational services at P < .005. | Rural areas may have less funding, less clinicians and less access to resources including psychiatry, and demonstrate less adherence EIT to model. Rural areas may also have greater access to community resources, highlighting some of the clinical opportunities challenges these services may face. Ring-fenced funding and ongoing managerial support may facilitate adherence to service models. |

Response bias in clinician self-report survey
No confirmation of actual practice
No control or measure of confounding variables, and geographical descriptor may be limited

| | | | based on service criteria. | range of barriers to sustainable implementation, including lack of clinician time, abundance of paperwork and limited service resources. | standardized care and an abundance of paperwork may represent key barriers to quality improvement in EIT. |

ANOVA, analysis of variance.
Relapse rate was defined in both studies (Burbach et al., 2009; Mantas & Mavreas, 2012) as increase in psychotic symptoms requiring hospital admission following a period of remission, though neither study specified the time frame for remission. All three studies described successful implementation of the hub-and-spoke model in their rural areas, commenting it provides managerial and geographical flexibility to enable early access to care. Professional networks with existing services was a commonly reported facilitator of successful implementation.

Cheng et al.’s (2014) study in Canada provided a direct comparison of a stand-alone and hub-and-spoke EIT both in rural areas using case control design. They reported that the stand-alone EIT had 70% of its population admitted to hospital whereas the hub-and-spoke had 31.8% admitted to hospital. They found higher reported general functioning using the Multnomah Community Ability Scale in the hub-and-spoke model, though this was not statistically significant. Though describing differences, the paper was unable to explain why they existed.

Lastly, Fowler et al.’s (2009) used historical case control design to compare a stand-alone EIT to a partial EIT and a community mental health team, finding that the stand-alone EIT demonstrated better outcomes than the partial EIT on a range of measures. However, their study lacked stringent methods of comparison as each group had different data points and differed significantly on demographic information.

In summary, four studies demonstrated positive clinical outcomes for hub-and-spoke EIT models in rural areas, two of which were direct comparisons to other service models. A stand-alone EIT also outperformed a partial EIT and community mental health team, suggesting that both hub-and-spoke and stand-alone EITs may be efficacious in rural areas and some limited evidence to suggest that hub-and-spoke may outperform stand-alone EIT in a Canadian setting.

### 3.2 Studies evaluating adherence to the EIT model in rural areas

Full details of the studies can be found in Table 2. Two studies used cross-sectional survey designs to evaluate the implementation of different aspects of the EIT model and factors that may be associated with implementation (Catts et al., 2010; Durbin et al., 2016), whereas two studies utilized a pre- and post-training audit design to evaluate the impact of training on adherence to aspects of the EIT model (Bedard et al., 2016; O’Kearney et al., 2004). Direct comparisons with these studies are not possible due to lack of standardized measures, different training programmes and different care settings across Australia and Canada. However, the studies reported low rates of between 16%-50% for adherence to EIT service model based on their individual measures (Durbin et al., 2016; O’Kearney et al., 2004). Training programmes showed limited and variable impact in improving adherence across teams (Bedard et al., 2016; O’Kearney et al., 2004), with authors suggesting that practical barriers such as lack of funding, managerial support and infrastructure for supporting and evaluating services may be contributing factors.

Rural EITs report less funding than urban services (Catts et al., 2010; Durbin et al., 2016) and less access to resources, such as Psychiatry time and physical health appointments (Bedard et al., 2016). Catts et al. (2010) study reported that the only significant predictor of successful implementation of EIT service model in rural areas was available funding. They suggest that a stronger national infrastructure for supporting implementation and adherence to EIT services in Australia may benefit this. Bedard et al.’s (2016) found low rates of adherence post-training in an EIT model. They suggested the staff resistance may be present to implementing EIT principles due to barriers around workload, time constraints and challenges around travel distance and the potential for storms. Authors broadly conceded that rural mental health may be under-resourced and the realities of the various geographical and service-related pressures require focused managerial and financial support.

In summary, rural EITs face challenges regarding demands on clinicians in light of increased travel time, time constraints and limited access to services like Psychiatry and physical health care, and further demands with lack of funding and managerial support. Three papers concluded with the suggestions for: ring-fenced funding for rural EITs; direct managerial support to alleviate the clinician barriers to implementation, such as time constraints, caseload and travel demands; and focused training for EIT service delivery (Bedard et al., 2016; Catts et al., 2010; Durbin et al., 2016). Studies all used different self-report measures and different training programmes, alongside having different geographical, cultural and care settings, and so direct comparisons are difficult.

### DISCUSSION

The presented studies demonstrate mixed results for the evidence base for EIT services in rural areas. With regards to clinical outcomes, the studies’ findings were largely in line with prior research on EIT services generally and specifically urban and inner-city areas, finding improvements in psychotic symptoms, general functioning, relapse rates and reductions in hospital admissions (Behan et al., 2017). Four studies demonstrated positive clinical outcomes for a hub-and-spoke model in rural areas and described its successful implementation, including partnership networks with local existing services and clear managerial support. However, all of the studies lacked specificity with regards to detailing what interventions and using clearly defined outcome measures spanning clinical outcomes and otherwise. It is notable that only two of the five studies utilized a measure of psychotic symptoms, and one of these studies found no significant difference comparing EIT to CMHT. By nature, evaluating actual service delivery reduces the level of available control, which limits the direct conclusions that can be drawn about what was effective. However, as naturalistic service evaluations, overall the presented studies suggest that EITs in rural areas - both hub-and-spoke and stand-alone - demonstrate similar positive outcomes to those in urban areas, though the evidence base as a whole does not provide clarity about what exactly is effective in rural populations. Cheng et al.’s (2014) study provided
the first direct comparison of two EIT models in rural settings, suggesting initial yet inconclusive evidence that a hub-and-spoke EIT demonstrated lower hospital admissions than a stand-alone EIT. Further research may expand our understanding of why, as the paper did not measure why those differences presented.

Regarding adherences to EIT services in rural areas, studies reported use of different measures of adherence, such as audit tools, and different packages of training to support adherence. Though all papers commented on adherence to the broad international EIT model as it was originally intended, potential differences across health care settings and issues of definition are important to consider and may impact the validity of the findings. The research highlights that clinician-reported adherence is generally poor, with some core components being delivered fairly consistently but others - including CBT, involvement of families, physical health monitoring and use of outcome measures - ranging from 16% to 50% usage across a number of teams. The evidence regarding training interventions to support adherence did not show positive outcomes beside two aspects of service delivery. Across the four papers, barriers to consistent adherence to the EIT model in rural areas included less available funding and service pressures including limited staff resource and time. The present studies were greatly limited by clinician self-report measures or audit tools relying on service-reported data, both resulting in a lack of confirmation of actual practice. Again, differences across Australian and Canadian healthcare structures and delivery may impact the findings. Regardless, the findings uniformly reported poor adherence and some statistical predictors of this, including being in a rural area. This implies that EITs in rural areas may not be delivering evidence-based practice if they are not adhering to the model which may have broader implications for poorer outcomes.

4.1 | Limitations of review

The present review is limited for being a narrative review conducted by a lone author. It is acknowledged that this results in bias in study selection and reporting is a risk to validity. The review only included papers written in English, which presents a potential bias regarding the culturally-bound nature of the findings. Additionally, though the evidence base has increased substantially since the prior Welch and Welch (2007) review, comparisons across the research are not possible, and the findings may not be generalizable internationally due to differences in health care settings and cultures. Lack of consistent use of reliable and valid outcome measures for both clinical outcomes and for monitoring actual service delivery remain an issue for this body of research.

4.1.1 | Clinical implications

There are two major clinical implications from the findings. First, rural areas present a range of opportunities and challenges for EIT services, but the research presented here demonstrates clinical outcomes comparable to the equivocal evidence for established EITs in urban areas (Behan et al., 2017). Clinically, the papers report that the hub-and-spoke model enables effective rural outreach, stable managerial support located in the hub, and opportunities regarding engagement with community venues (eg, voluntary job opportunities in farming communities; engagement with local schools or youth hubs). Relapse rates and clinical outcomes compare favourably to CMHT and partial EIT services. Second, a predictor of the clinical adherence to the EIT model may be having some form of registration under a governing programme or body, so local initiatives can support this in rural areas using training, on-going supervision and managerial support.

4.1.2 | Research implications

Research into rural EIT services has grown since the last review (Welch & Welch, 2007), though it remains limited in both design and scope. Further research could begin to explore whether elements of the hub-and-spoke model address the specific challenges facing rural service provision, the feasibility and efficacy of specific interventions including CBT, and focus specifically on how able rural EIT services are to adhere to evidence-based service provision. Regarding specific interventions, other fields of rural mental health care include telemedicine approaches using video conferencing to deliver specific interventions, which research has begun to explore in early psychosis (Stain et al., 2011). Further research is required here into the acceptability and outcomes of such techniques in rural EIT populations.

4.1.3 | Service and political implications

Rural EIT services are a growing entity internationally, yet it seems they are under-resourced and under-researched. Service providers can follow the successful co-ordination of the implementation and evaluation of services, such as efforts made in Ontario (Durbin et al., 2016); providing training for EIT services shows some efficacy for improving adherence to the model, and managerial support and supervision facilitates engagement with local mental health and community networks. Politically, this growing field highlights a tension in providing robust, evidence-based services with enough flexible adaptations to a population with different needs than present knowledge wholly accounts for. More efforts regarding targeted research exploring the needs of this population and what works would be beneficial.

5 | CONCLUSIONS

The present review updated a prior review exploring the state of the evidence base for EIT services in rural areas (Welch & Welch, 2007). Although the evidence base has grown from three to nine studies, it remains limited in both design and scope. Emerging findings indicate that rural EIT services are as effective as urban services using some adaptations to aid implementation, including using hub-and-spoke
models. Research from service providers highlights that rural services may be under-funded, and training has some limited impact on improving adherence to the EIT model. Future research and political efforts should continue to evaluate the specifics of the needs of this population and how a flexible use of the EIT model can be effective.

**DATA AVAILABILITY STATEMENT**
Data sharing is not applicable to this article as no new data were created or analyzed in this study.

**ORCID**
Alastair Pipkin https://orcid.org/0000-0001-8202-6383

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CASP Cohort Study Checklist

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