Healthcare support to older residents of care homes: a systematic review of specialist services

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Introduction

Providing specialist healthcare support to older people living in care homes, with and without nursing, is a growing international concern (Katz, 2009; Briggs et al., 2012; Tolson et al, 2011; Morley et al., 2014). This is a growing population with complex needs but where, organisationally, delivering the necessary healthcare support is a contested area. In the UK context, the delivery of health services for long-term care home residents presents a considerable challenge to the National Health Service (NHS) (Carter, 2012; Robbins et al., 2013; Gordon et al., 2014; NHSE, 2016). Estimates suggest that around 400,000 older people live in care homes in the United Kingdom (UK) (BGS, 2011; House of Commons Library, 2017), and this number is forecast to grow significantly in coming years (Wittenberg *et al*. 2004; Kingston et al., 2017). This population has multiple needs, many of which stem from progressive chronic conditions including neuro-degenerative, musculoskeletal and cardio-respiratory disease. Visual and hearing deficits are common; around 40 per cent of residents are depressed and the majority have dementia (British Geriatrics Society, 2011). There are high levels of dependency, multiple morbidities and polypharmacy evident in residents (Gordon et al., 2014). Another survey of care homes found 90 per cent of residents presented with at least one of the following: total dependence in mobility, severe hearing or visual impairments, dual incontinence, dementia, confusion or challenging behaviour (Lievesley, Crosby and Bowman, 2011). However, responding to this array of needs has challenged the organisation of healthcare support, with those older people residing in care homes often receiving a relatively poor service (Carter, 2012).

Despite their complex need profile, care home residents have often lacked specialist healthcare support available to the general older population and have been described as a 'profoundly marginalised group' (Dening and Milne, 2011). Studies suggest that care home

residents receive a poorer quality of care and have poorer outcomes than those living in their own homes. For example, in the UK, a review of patient records of older people in Bristol showed that residents of care homes with nursing were more likely to be prescribed inappropriate or unnecessary medications and less likely to be taking beneficial drugs or receive regular monitoring if diagnosed with a chronic disease than individuals living in their own homes (Fahey *et al*. 2003). In a large scale, retrospective review of 326 general practices in England and Wales, Shah *et al*. (2011) found significantly lower attainment of quality targets for chronic disease among older care home residents when compared with an adjusted community-dwelling population. High levels of morbidity, polypharmacy and need for expert multi-disciplinary care were identified in a detailed survey of residents (Gordon et al., 2014). Similar concerns have been identified internationally, with evidence of fragmented care to residents with little continuity, and a cycle of multiple hospital admissions from nursing homes (Stark, Gutman and McCashin 1982). It appears that addressing this multitude of residents' healthcare needs presents a major challenge for healthcare providers.

Developing appropriate healthcare support to care home residents can, potentially, take many forms. In the UK, most care home residents' medical care is provided by General Practitioners (GPs), many with no specialist training in the care of older people. Evidence suggests that the quality and availability of primary care to care homes is variable (O'Dea, Kerrison and Pollock *et al*. 2000; Carter 2012). Key features include lack of integrated care planning, variable access to NHS services and lack of continuity of care (NHSE, 2016). One response to this, internationally, has been the development of dedicated healthcare teams providing support to care homes, reflecting arguments about the potential benefits from more specialised healthcare support, expert clinical leadership and multidisciplinary care for this population (Kane *et al*. 2003; Schols et al., 2004; BGS, 2011; Tolson et al., 2011; Morley et

al., 2013; Gordon et al., 2014). Developments in the UK have been very different, with far less specialisation (BGS, 2011; Carter, 2012), although a range of local initiatives have developed to meet this need (NHSE, 2016). A review of surveys in this area (Iliffe *et al*. 2016) testifies to a range of provision, including enhanced primary care, *e.g.* medication reviews or post-admission assessments, and more specialist healthcare teams, *e.g.* geriatrician-led or nursing teams. These initiatives, locally designed, may offer different and more specialised approaches to address the needs of older residents. However, in comparison with the support that old age mental health services provide for care home residents (Dening and Milne, 2011), rather less is known about the precise forms, staff mix, organisation and delivery of medical services to effectively address older residents' physical healthcare needs. Indeed, international expert reviews of research priorities in care homes have noted the need for studies of different models of care and their impact, the lack of clinical leadership and involvement in care homes (Tolson et al., 2011), and the linked difficulty of translating evidence based care to practice (Morley et al., 2013).

Rationale

These issues suggest the need for an overview or systematic exploration of healthcare services to care homes that have been delivered, either in 'real world' settings or as part of research studies. To this end, this paper presents findings from a systematic review of published literature, following Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher *et al*. 2009), reporting instances of specialist healthcare services, designed to address the physical healthcare needs of older residents of care homes. The quality of descriptions of the services in the literature was assessed and conclusions drawn regarding the possible ways of delivering healthcare support to care home residents.

Objectives

The aim of the review was to provide an overview of the range of services that have been delivered and studied and to address the following research questions:

1. What are the core features of variation in the organisation, activities, and responsibilities of healthcare support services?
2. What is the evidence regarding these services in terms of their design, scope and potential effectiveness?
3. What recommendations can be offered as to the types of information that should be specified when reporting such services?

Methods

The systematic review elements in this paper follow the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher *et al*. 2009), with a pragmatic, narrative synthesis of the evidence relating to specialist healthcare support services to care homes.

Protocol and registration

The review was registered on the International Prospective Register of Systematic Reviews (PROSPERO 2012:CRD42012001885), http://www.crd.york.ac.uk/prospero/search.asp, and a protocol is available.

Eligibility criteria

For a service to be included in the review it must have been designed to address the physical healthcare needs of older people, permanently resident in a care home, with or without nursing. This definition of a specialist healthcare support service excluded initiatives

designed for or dedicated to individuals temporarily resident in a care home, provided solely by employees of a care home, or which focused exclusively on the mental health of residents. The exclusion criteria were developed and then applied in a hierarchical fashion; thus, if an article met the first exclusion criterion the remaining criteria were not used. The final exclusion criteria are shown in Table 1.

Search

Our aim was to identify documents that focused on specialist support interventions for the medical care of older people resident in care homes. Possible search terms were identified from relevant publications, the social ('long-term') care websites of countries with known alternative terms to those used in the UK, and from the Medical Subject Headings (MeSH) library. Potential search strings were piloted with the EMBASE database (including MEDLINE). The proposed search strategy was examined with reference to the abstracts and titles of relevant publications already known to the research team; the final search strategy included three blocks of terms relating to 1) care homes, 2) healthcare, and 3) older people. A fourth block relating to healthcare professions was excluded on the basis that this constrained unnecessarily the scope of the search.

So that potential articles were able to include a variety of disciplines, a broad range of electronic databases were searched, which included: AgeInfo; CINAHL Plus (Cumulative Index to Nursing and Allied Health Literature); The Cochrane Library; CRD (Centre for Reviews and Dissemination); EMBASE (incorporating MEDLINE); HMIC (Health Management Information Consortium); PsycINFO; PubMed; Social Care Online; and ISI Web of Science (with conference proceedings).

The search strategy was adapted for each database, and the complexity of the searches varied in accordance with the capability of the databases' search engines (see Table 2 for an example search strategy).

Table 2 here

Where possible, the search terms were mapped to Medical Subject Headings (MeSH) or other controlled language to enhance the search. The searches were restricted by the following inclusion criteria: A) Published between 01/01/1990 and 31/12/2010, and B) English language. The database searches were performed in January 2012. To supplement the electronic database searches the reference lists of included documents were hand-searched, and documents suggested by members of the research team and stakeholders were assessed for relevance. The retrieved references were initially examined to identify any existing systematic literature reviews, which directly addressed the research question. No such reviews were found.

Study selection

The full document title and abstract were sought for all references identified through the searches, above. One researcher (RH) then examined each of these and applied the exclusion criteria. Any uncertainties were discussed within the research team (primarily between RH and PC). Full texts of all documents expected to be appropriate for inclusion were then retrieved.

Data collection process

We designed a data extraction tool to obtain information on the organisation, activities and responsibilities of each service and the healthcare professionals involved. As one purpose of the review was to identify the types of services that have been delivered, the tool was dedicated primarily to extracting information on the different elements of the interventions. That is, what was done, how, who by, when, who to and where. Where available, information was also extracted regarding evaluations of these interventions. We also included fields to describe the context in which the service was delivered, and to enable assessment of the quality of the service descriptions. The tool was piloted with several documents, then reviewed and revised, as it evolved over time. Primary data extraction was carried out by one of three researchers from health services research (RH), social work/health services research (PC), and psychology (KP) backgrounds with independent data extraction for 25 per cent of the papers by a third researcher from a nursing background (ST).

Data items

In the final dataset, information was recorded on:

- *Publication data*: full reference, type of publication, how identified, whether linked to other articles retrieved (that is, if related to a service also described in another document), and details of the author's institution(s).
- *General study data*: type of study (see Figure 1) and the context in which the service was delivered (that is, as part of a research study, a pilot, or a 'real world' intervention). We also included information on the aims and objectives of the service and those of the study (where these differed); the date and/or duration of the service, and its geographical location; the sample population (the number and type of care homes and/or care home residents involved); an intervention summary, highlighting

its main focus; and information on how the service was funded and who had medical responsibility for residents.

- *Elements of the intervention*: (a) Assessment: what assessments were carried out pertaining to the health of residents; how this was done, for example, through use of clinical judgement or formal tools; who by, including whether members of the specialist service had direct contact with residents; which residents were assessed and when, *e.g*., in specific circumstances, routinely or as required; and where this took place, *e.g*., within the care home or at another location such as a hospital. We also noted whether assessment included 'medication review' and/or 'other assessment', relating to a resident's health, this included making diagnoses and developing treatment plans. (b) Management Information: what preventative, routine, rehabilitative and acute care, treatment or therapy was provided to care home residents by the specialist service; who this was provided by; which residents received this and when; and where this was carried out (*e.g*., at the care home or at another location such as a hospital). We also noted whether or not management included 'medication management' (the process of prescribing medications or amending existing prescriptions) and/or 'other management' (the process of carrying out other forms of care, including making referrals/ordering tests; administering medications; providing IV therapy, physiotherapy, specialist equipment, and wound care; and supporting residents to self-manage their health). (c) Recommendations and advice/informal training: any support provided by the service to other healthcare providers (*e.g.,* care home staff and/or residents' GPs) in relation to the assessment and/or management of residents. This encompassed making recommendations following a medication review or other assessment, and providing advice and training on an ad-hoc basis. Information was obtained on what was provided, how this was done (for example, in

person at the care home or through a written document), who did this, who this support was offered to and when. (d) Formal training for care home staff: the training provided to care home staff, how this was delivered (*e.g.*, through lecture or workshop or through individual supervision and mentoring), who provided by, who offered to (*e.g.*, all care home staff or specific groups such as qualified nurses) and where it took place (for example, in the care home or in a community setting). (e) Other elements of the service: other ways the service supported care homes and residents (*e.g.*, by audits of care processes, networking or liaising with other services, or by implementing new care processes), how this was done (*e.g.*, through record review, development of networking groups, or revising standard operating procedures and updating documentation), who carried this out, and who received the support and when.

- *Specialist input and liaison:* We listed the types of staff involved in the specialist services and extracted information on how many staff were involved and how much time was committed. Data were also sought on how often specialist staff visited care homes and the time spent.
- *Reported data:* Types of data reported were categorised as being narrative only, qualitative, quantitative, or both qualitative and quantitative. In addition, we identified whether the following were reported: (a) Satisfaction/opinions data: pertaining to 'patient satisfaction/opinions' (either directly or from proxies) or 'staff satisfaction/opinions' (specialist or otherwise) with the intervention, whether measured through interviews or questionnaires. (b) Outcomes data: pertaining to the possible impact of the intervention on residents. These data were divided into: 'direct patient outcomes' (*e.g.*, measures of functional ability and cognition, number of health-related incidents, *e.g.*, falls, and mortality); 'surrogate patient outcomes' (*e.g.*, number of hospital admissions, length of hospital stay, and number of visits from

outside healthcare professionals, those not part of the specialist service); and 'process outcomes' (for example, changes in the number of residents seen, and the duration and/or frequency of staff input). Data were also obtained on 'cost outcomes' (*e.g.*, data relating to whether or not the service incurred additional costs or cost savings).

A short summary of the main conclusions, as determined by the authors of each document, was also noted.

Figure 1 about here[HERE 16 June]

Quality assessment

We assigned each article a rating based on a simple rating tool designed specifically for the study, reflecting the particular focus upon the content of interventions. Articles were rated against four criteria to derive a score concerning whether the intervention was well described (yes, clearly = 1; yes, to some extent = 2; no = 3; not applicable = 0), with lower scores indicating higher quality. The four criteria were: what (services were provided); how (tools, protocols, duration of intervention); who to and when (target population); and where (location of delivery).

Results

Study selection

Eighty-four articles meeting the inclusion criteria were eventually selected for full data extraction (Figure 2) reporting on 74 separate interventions. Of these 74 interventions there were: 27 from the UK; 26 from the US; 7 from Australia; 4 from Sweden; 3 from Canada; 2 from Hong Kong and 1 each from Singapore, Norway, Spain, New Zealand, and The Netherlands.

Of those excluded, the majority (61%) pertained to populations not specific to older residents of care homes with 28 per cent of articles not directly related to residents' medical care.

Study characteristics

A summary of the included studies is shown in Table 3. These studies testify to a broad range of approaches to healthcare support developed and, on occasions, evaluated in England, Scotland, Wales, Northern Ireland and other countries across Europe, North America, Asia and Australasia. Some of these services have aimed to address residents' general healthcare needs, whereas others have concentrated on specific needs or risks, for example, wound care or falls. These services incorporate a mixture of systematic screening, assessment, care, recommendations and training. In the UK, they have mainly supported care homes with nursing or a combination of homes with and without nursing. For the descriptions of the 74 healthcare support services ('interventions') in the review, there was sometimes evidence across multiple papers with different authors; these separate services have been grouped together in bold.

The literature was disparate in terms of the aims of the interventions studied and in design and duration of studies and samples of residents or homes considered. The majority of citations were service descriptions (N=28), where no outcome data were provided or data (often cost data) were quoted but no measurements, e.g. from individual residents, were provided. Service descriptions often did not detail the length of the study period (the period to which data relates), since the service was often in existence longer than the evaluation of it. There were multiple before-after studies (N=14), cross sectional studies with one group (N=6), cross sectional studies with more than one group (N=6), one cohort study and one non-randomised trial. Twenty randomised trials were reported, most (N=16) were cluster RCTs, with

randomisation at the care home level and four other RCTs. Six studies described or provided evaluative material from the EverCare programme in the United States (Kane *et al*. 2003), created in 1986 and employing a nurse practitioner team, providing healthcare to nursing home residents.

There were several challenges in extracting data from the included studies. In many cases, the services or interventions were not described clearly and there were important details of some studies omitted. Often the stated aims of the evaluations were slightly different to those of the service or intervention and it is the aims of the interventions that are shown in the descriptive summary in Table 3. In some cases, for example those in Ryan (1999), Hui *et al*. (2001) and Doherty, Davies and Woodcock (2008), details of the samples studied were left unclear and it was difficult, if not impossible, to show numbers of residents studied, in terms of the impact of the service on key outcomes.

There were twenty five (30%) papers retrieved that reported cost data for the service in question. However, where they existed, costs were rarely detailed at the resident level, e.g. 'cost per resident per week' and tended to be at the aggregate level, e.g. 'total savings per year' (Watret and Bruce, 2007), much of the data for such conclusions being extrapolated from estimates as to the use of particular inputs. In some studies, for example, Winstanley and Brennan (2007), the use of inputs was detailed (in this case, 'a 7 per cent reduction in hospital admissions') but there were no unit costs reported and no description as to how data on cost savings, arising from reductions in these inputs, were arrived at. There were 10 (12%) papers that were notable exceptions to this, where resident-level data were recorded. For example, Christensen *et al*. (2004) studied average prescribing costs over samples of residents before and after the intervention and Mulrow *et al*. (1994) studied service costs from a trial of

physical rehabilitation for residents. In these studies, 'per resident' costs were calculated, making it possible to discern changes from before the services' introduction or against controls and estimate the magnitude of this effect statistically. However, despite often being labelled as such (*e.g*. Burl, Bonner & Rao, 1994), there were no truly cost-effectiveness studies, with costs detailed alongside outcomes such as resident quality of life, Quality Adjusted Life Years (QALYs) or symptom reductions. There were only two (2%) papers where outcomes were detailed alongside resident-level costs. The study by Crotty *et al*. (2004a) did detail per resident costs and also outcome, in terms of resident behaviour change (using the Nursing Home Behaviour Problem Scale; Ray et al. 1992). Mulrow et al. (1994) calculated per resident costs and also outcomes using the Sickness Impact Profile (Bergner *et al*. 1981). However, in both cases, the authors did not link these two measures together in any analysis (such as a metric of costs/behaviour reduction) to allow cost-effectiveness conclusions to be drawn.

Thus, the descriptions as well as the evaluations of these services could be described as, at best, varied and the quality of description, in terms of our quality ratings, were variable; with the lowest quality paper (Lewis and Jones, 2002) scoring 12 and multiple studies of relatively high quality (with a score of 5), but no papers of higher quality than this.

The features of the services, in terms of key areas of variation of healthcare support to care homes are summarised below.

Team membership

This describes the staffing commitment of specialist staff and team size. Owing to the broad inclusion criteria of this review, there were a variety of team membership compositions across

the studies, with varying sizes, which were from several countries with differing healthcare systems. Thus, a clear-cut summary of results was limited.

There were typically 4-6 different types of professionals included in the teams evaluated. The most prevalent professions included were physicians (N=24) and pharmacists (N=21). A wide range of evaluations included similar professions in their teams, such as "clinical pharmacologist" (Midlöv et al, 2002), but these were counted separately. Other types of professionals included in the teams were geriatricians (e.g. in Bellantonio et al., 2008) nurse practitioners (e.g. Elener, Hayes and Scott, 2008), "nurse specialist" (e.g. Hui et al, 2001) and "clinical nurse specialist" (Sankaran et al, 2010). General Practitioners (GPs) (e.g. Patterson et al, 2010) were also referred to by several evaluations, but were limited by the number of studies that were based in countries using this nomenclature. Some studies included a gerontologist (Ackermann and Kemle, 1998), a clinical pharmacist (Roberts et al, 2001), a practice manager, and pharmacy technicians (both Watret and Bruce, 2007), but authors were often unclear and inconsistent in their descriptions of team memberships, including their compositions, exact numbers, and roles of team members; for example, van der Putten et al (2010) did not clearly state the involvement of a GP in their paper. Multiple authors reported the inclusion of only one form of staff-type. For instance, Payne and Stevens (2005) reported the involvement of one speech pathologist. Stolee *et al*. (2006) reported the involvement of a nurse practitioner(s), but failed to state clearly the numbers involved.

Medical responsibility and access

We examined how authors described the inclusion of GPs; their roles and responsibilities, and how care home residents were referred to the teams involved in the studies. Where stated, the medical responsibility for the majority of the services lay with either residents' Primary Care

Practitioner or similar, GP, the specialist service or the GP as part of the specialist service. As already mentioned, a variety of studies were based in countries where the healthcare system included GPs. In some of these, other members of the research team liaised with residents' GPs, who were not involved in the actual research project, so such studies were not considered to have "included" GPs as part of the research team. For instance, in Kane *et al*. (2002), nurse practitioners liaised with residents' GPs to provide advice and training to care home staff; whereas in others, including Crotty (2007), GPs were used to identify residents who met the inclusion criteria. However, authors were generally unclear about how the care home residents were referred to the study teams. The precise roles and responsibilities of GPs in the services were often unclear. For instance, Furniss *et al.* (2000) stated that medication reviews were conducted in the GP surgery, but they did not state clearly the GP's involvement throughout the the study. The majority of medication reviews were conducted using pharmacists with little or no mention of residents' GPs. For example, in Martinez *et al*. (1995), the GP did not appear to be involved in the medication review; it was not clear if recommendations resulted in any changes and, given the lack of control in drug administration at the home, it was unclear if any agreed changes would be properly implemented.

Assessment and/or management of care

Studies involved an array of specialists, including NPs and GNPs, Geriatricians, CGATs and Physicians. Most articles stated clearly that the specialist(s) had direct patient contact, whereas a minority of services had direct contact with 'some' residents (e.g. Sävenstedt, 2002), or no patient contact at all (e.g. Corbett *et al*., 1997). Some authors were unclear, such as Sankaran *et al*. (2010), who stated that there was no contact for medication and clinical case reviews, but were unclear if some residents were seen as part of a complex case report.

There were a variety of ways management of care was included, including medication management or referrals to other services. Many studies were of medication reviews, included medication reviews, or involved giving advice to the care homes or healthcare providers, which typically consisted of recommendations based on the medication review. For instance, in McAiney *et al.* (2008), Nurse Practitioners advised residents' physicians and care home staff on requests for diagnostic tests and interventions. However, studies involving a medication review often did not describe whether any form of management was included.

Training and support

Given the variety of interventions included, there were inevitably multiple types of training and support identified. For instance, in Ryan (1999) and Kane *et al*. (2002, 2003), nurse practitioners conducted the training; whereas in Johnson and Binney (2003), the project manager, who had a nursing background, conducted some training for care home staff. In McAiney *et al*. (2008) and others, the training provided concerned detecting early symptoms of illness and/or how to manage episodes of illness, or how to screen for a disease (e.g. Larsen *et al*., 1991). Training was also provided on falls prevention and falls-related issues (*e.g*. Jensen *et al*., 2002 and 2004; Ray *et al*., 1997; Cox *et al*., 2008), whereas for many services, the inclusion of training and support information was not relevant (e.g. Maack *et al*., 2008; Aigner *et al*., 2004; Janardhanan *et al*., 2008). In most cases, training was provided to care home or nursing home staff. Some authors specified that training was provided as and when needed, but there was an inconsistency in the reporting of exactly when training was conducted and for how long.

Synthesis of results

A pragmatic, narrative synthesis of these results was undertaken by identifying key exemplar approaches, in terms of different 'models' of healthcare support to care homes that could be discerned. This typology of models was constructed from the different patterns of variation, in terms of key attributes, shown by the included studies. This typology was developed by the authors and was guided by earlier work (Hays *et al*. 2012). The attributes employed were: the type of staff involved, *e.g*. whether or not there was a senior specialist clinician as part of the team) and the component elements of the intervention, e.g. whether only assessments were undertaken, whether this was also followed by healthcare management of the resident, or whether, instead, the service was provided to homes rather than individual residents (*e.g*. to advise care home managers on appropriate care or train nursing staff in homes on correct procedures). Using these combinations of components to construct models has particular utility when considering more strategic approaches to developing health care in care homes, such as the planned incremental approach building on local initiatives of Enhanced Care in Care Homes (NHSE, 2016), since it makes the elements of intervention more explicit.

Table 4 summarises data relating to the different models of healthcare support exemplified in the literature. These models are preliminary descriptions, containing key attributes from the general data above, aggregated by their numbers of 'interventions; i.e. distinct, described services where, in some instances, there was evidence from multiple papers by different authors. Fifteen services described an Assessment – No Consultant Model, such as the 'consultative' model in Canada described by McAiney *et al*. (2008) of Nurse Practitioners assessing residents' healthcare needs, often offering specific recommendations to primary care physicians, but with no senior responsible medical practitioner in the team. Five services were of an Assessment with Consultant Model, such as that of Sankaran *et al*. (2010), with assessments of residents undertaken by a multidisciplinary team, including a community

geriatrician with advice and training offered to homes. Twenty-five services exemplified an Assessment/Management No Consultant Model, such as that of the US Evercare programme, where nurse practitioner teams were involved in assessing, but also managing residents on an on-going basis, including liaison with the primary care physicians holding medical responsibility (Johnson, 1993; Kane *et al*. 2002). Twenty-five services, in contrast, were of an Assessment/Management with Consultant Model, such as that by Crotty *et al.* (2004a,b), employing a Consultant Pharmacist in outreach to residential care homes in South Australia, focusing on falls reduction and stroke prevention. Finally, four services exemplified a Training and Support Model, where individual residents were not assessed or managed but support was provided generically to homes. Two examples of this can be given. The descriptive study by Butler (1997) detailed the involvement of a specialist nurse in residential and nursing homes in London, UK; the nurse introduced staff guidelines and training and acted in an advisory capacity and liaised with regulators but did not see individual residents. The study by Lewis and Jones (2002) in Nottingham, UK, described the employment of a multidisciplinary team to support homes, including training, the updating of records and liaison with the Inspectorate monitoring quality in nursing homes.

In terms of the effectiveness of these different models, the evidence was mixed. There were 28 studies that provided only descriptive data as to what authors considered were the strengths of the model of support evaluated. Taking studies that provided some type of comparison of different approaches and that included detailed outcomes to measure the effectiveness of the approach (N = 56), it arose that all models of support had at least some evidence concerning effectiveness. Table 4 provides some indicative evidence from exemplar studies under each model, where these examples are from articles with a relatively high quality rating.

For an Assessment No Consultant Model, the clearest evidence was from an RCT of a pharmacist's medication review of nursing home residents (Furniss *et al*., 2000), which reduced the number of (inappropriate) medicines prescribed with associated cost reductions, with minimal impact on morbidity and mortality.

For the Assessment with Consultant Model, the papers detailing evaluations were not of high quality, relatively speaking (quality ratings = 7–9). The highest quality paper (rated 7) was from an evaluation of a specialist clinical pharmacology medication review (Ulfvarson *et al*., 2003). This was described as having beneficial results in terms of changed drug therapy to patients, with advice followed by the responsible physician. However, there were no significant changes in residents' survival or health outcomes.

For an Assessment/Management No Consultant Model, there was evidence of a pharmacy review intervention, from a large UK prospective randomised controlled trial (Zermansky *et al*., 2006), which led to appropriate medication changes following recommendation to residents' GPs, and a consequent reduction in falls at no extra cost. An example of a *potentially* beneficial intervention, in this vein, was that of Ray *et al*., (2005), an RCT of a falls prevention program where training was provided to care home staff to improve the living environment and safety of residents. This resulted in a non-significant trend towards fewer injuries for residents. It was conjectured whether this was because of problems with program fidelity, as it was administered by care home staff rather than the intervention team itself.

For the Assessment/Management with Consultant Model, a range of evidence was available across studies. One study described a multifactorial intervention program to reduce falls and fall related injuries in older residents (Jensen *et al*., 2002), focused on those at high risk of

falls. The intervention included educating staff, modifying the immediate environment, exercise programs, supplying and repairing aids and reviewing drug regimens. The study found a reduction in falls and femoral fractures in those receiving the intervention compared to controls.

For a Training and Support model, all of the four services evaluated relied on either descriptive comments concerning benefits or acceptability of the intervention and satisfaction of staff. For example, a diabetes education initiative for care home staff (Gallichan, 2002) found an increased awareness of the specific needs of residents with diabetes. Similarly, staff receiving a web-based tele-dermatology system in a nursing home in Singapore (Janardhanan *et al*., 2008) found it useful for managing skin conditions. Also critical to the perceived success of this service was its acceptability at every level of the organisation; management, the matron of the home, and nurses.

Discussion

Summary of evidence

This study examined the literature pertaining to specialist healthcare support to older people resident in care homes. The diverse nature of this literature necessitated an iterative approach to review and data extraction, with data extraction fields being modified throughout the process. However, the overall approach was one guided by consensus amongst the research team, with the material here focusing on features of healthcare support services that may have broad applicability, when translated to a 'real world' context.

With respect to the central aim of this review, the findings indicate a wide scope of possible ways of delivering healthcare support to care homes. In terms of our first research question, namely models of support synthesised from the literature, these exhibited variation in: who delivered the interventions; their content, in terms of whether assessment only was provided, or whether this was also allied to management of the resident; whether a senior responsible clinician was involved in leading the team or not; and also whether support was to individual residents or only to the care home itself or its staff. Most services (N=50) offered residents a combination of assessment and management. This variation, from the literature, echoes the findings of a recent review of surveys of healthcare support services in England (Iliffe *et al*. 2016) where, of the ten specialist services to care homes identified, several staff groups were involved – community pharmacists, nurses, geriatricians, tissue viability and continence teams, amongst others. These were specialist teams offering a combination of assessment, advice and/or management to individual residents. In contrast, a model with very few (N=4) evaluations, the Training and Support Model, was also identified here. This model has only been investigated with reference to staff perceptions, with no detailed evidence of its impact on the working practices of homes or the routine care of residents (e.g. its impact on hospital admissions). By contrast, reviewing educational intervention priorities, Morley et al. (2013) ranked case based inter-professional rounds as the top priority in this field. The definitions of these models and their core components may be useful in highlighting issues that require addressing by those wishing to design such services in the future. In particular, the Enhanced Health in Care Homes Model (EHCH) (NHSE 2016) articulates an approach to development of seven areas of practice in care homes. The components of interventions identified in the current models can assist in specifying elements which can fit into the developing EHCH models and for commissioners in localities.

In terms of our second research question, in particular in judging the effectiveness of the different approaches, designs of studies were diverse: research trials of approaches, uncontrolled studies, pilot studies, service development and audits. Synthesising the evidence was therefore challenging and evidence as to effectiveness was mixed. There was more evidence available from services representative of an Assessment and Management model, either with or without a consultant, than those representing other models. Overall, although drawing conclusions about effectiveness per se was difficult, each of the healthcare support models considered did have *some* evidence concerning effectiveness. However, there were several limitations, around both the data collection and review process. These enable us to make recommendations as to the types of information that should be specified in the future reporting of these services, as discussed below.

Limitations

Several limitations emerged during the data collection process for this study. There were many problems in the transparency of data from the literature, such that data extraction was challenging; many studies did not give clear information on the nature of the service, the samples of residents or homes studied and the nature of the effects elicited. Cost data in particular was of poor quality, judged against the benchmark of established health economic methods (Drummond *et al*. 2005). Data on costs were often aggregated with total cost savings described from interventions, but often without the data used described in any detail. This was in contrast to per-resident data being used, from which any cost consequences of undertaking the intervention, compared with a control condition, could be discerned. Such data make it very difficult to generalise and offer comparisons with other interventions of a similar nature and do not offer any estimates of the variability of costs across residents with different needs, compared with standard or usual care; in the UK case, for example, from

general practitioners (Drummond *et al*. 2005). Such problems make judgements of the cost-effectiveness of different models of healthcare support difficult, if not impossible.

There were also limitations arising from the review process itself. The range of research designs included and the disparate nature of the material necessitated a pragmatic approach, especially around the synthesis of the material. There may be criticisms levelled at this approach. For example, our description of different models of healthcare support, essentially built around the twin pillars of staff designation (whether a senior responsible clinician led the teams or not) and whether assessment and/or management were included, was just one way of constructing such a typology. Other work in this area, for example has identified a more realist, theory-driven, typology of healthcare support to care homes, based around key themes, such as relational working (across health and social care), provision of age-appropriate care, and governance and incentives (supporting residents' access to appropriate healthcare) (Goodman *et al*. 2015). The approach adopted here is defensible, but is merely one way of organising the material relating to processes and effectiveness of different ways of providing such support.

Finally, from a review such as this, care needs to be taken in generalising across different systems. Care Homes differ across different jurisdictions in scale, resident-mix and access to clinical expertise, each of which can shape their need for and acceptability of particular health care responses.

Conclusions

As discerned from this review, there is much evidence from the literature on the different forms of healthcare support to care homes that have been implemented and evaluated.

However, this evidence is quite disparate, with a lack of transparency in the data, making judgements, certainly of relative effectiveness, difficult. In addressing our third research question, several recommendations can be offered as to the types of information that should be specified when reporting such services. These include, firstly, ensuring that any approach is clearly specified, which this review found was often not the case. Secondly, finding ways to guarantee that intervention protocols, where specified, are adhered to, especially if the approach is being delivered by care home staff on the advice of the specialist healthcare team rather than by the team themselves. Thirdly, and importantly, consideration of the actual implementation of models of support is a necessary prerequisite to developing effective approaches. This should take heed of factors such as regulatory procedures, additional training, effective communication of aims, and the associated 'buy in' from care home staff (Michie *et al*., 2011; Hays *et al*., 2012). The evaluation of the Care Home Vanguards in England (NHSE, 2016) may further elaborate these influences.

Taking the findings from this review in the round, there are several suggestions on how to potentially improve the evidence base, reviewed here, to offer evidence of the *relative* effectiveness of different approaches to delivering healthcare support. Firstly, it may be useful to undertake a meta-regression (Stuck *et al*., 2002) of the RCTs conducted in this area, although this may not be possible, as the trials may be heterogeneous in terms of key characteristics. There were 20 RCTs from this review, with often clear comparator groups available, on which to draw robust conclusions about impact. Such an analysis might also be able to suggest possible reasons why certain approaches, configuring staff and resources in different ways, were effective or only potentially effective. Secondly, a study or studies could usefully be undertaken where the effects of different mixes or combinations of inputs (input mix) of different components of models of healthcare support are compared so as to discern

the key ingredients. An observational study of this kind would be well placed to explore the natural variation of component mix upon outcomes in the absence of any standard form of treatment as usual (Chester et al., 2017). This would appropriately reflect a context where the form of healthcare provision to care homes in localities varies to an extent whereby it would be unrealistic to designate it as "standard care" as a comparator. Such a study should, as well as defining the components of interventions explicitly, compare defined outcomes (*e.g*. mortality, morbidity and quality of life) against 'per-resident' costs so that the cost-effectiveness of each approach can be ascertained. This would contribute to the research agenda identified by Tolson et al. (2011) of identifying and evaluating different models of healthcare provision to care homes and also assist in articulating the specific components of healthcare interventions as part of the implementation of Enhanced Health in Care Homes (NHSE, 2016). Building an economic model of relative cost-effectiveness, from the literature contained in the present review, in a manner undertaken with other interventions (Cobiac *et al*., 2009), may also be a fruitful way forward prior to such a study.

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TABLE 1: Exclusion criteria for the systematic literature review

Criteria	Details
Not specific to older people resident in care homes	Documents were required to be focused on older people permanently resident in care homes. Documents focusing on older people in care homes for short-stay rehabilitation or respite care were excluded, as were documents focusing more broadly on older people, some of whom happened to be residing within care homes.
Not directly relating to residents' medical care	Documents relating to residents' health status but not their medical care, such as the prevalence of particular conditions within care homes, were excluded. Documents discussing social, cultural, and other non-medical interventions (for example, restraint use or specification of advance directives) were also excluded. In addition, unless this was for the purpose of evaluating an intervention directed at improving a resident's medical care, documents relating to assessments, surveys, or reviews of the quality of care or care processes within care homes were excluded.
Exclusively mental health related	Documents relating to residents' mental health but not their physical health were excluded. Documents were not excluded on the basis of the mental health status of the care home residents they pertained to, for example, studies focusing exclusively on care home residents with dementia would not be excluded on this basis alone.
Overview, guideline or recommendation document	Literature reviews, or reviews of multiple services; documents detailing care guidelines, making recommendations for care, or discussing barriers to implementing care models were excluded.
Not relating to an applied specialist outreach service	An applied specialist outreach service was defined as one that made a systematic attempt to provide dedicated healthcare support to care homes and their residents. Thus, any documents not detailing this type of service were excluded.
Non-standard publication format	Non-standard source documents (that is, conference abstracts without references and theses or reports where a linked, peer-reviewed, article had been published).

TABLE 2: Example Search Strategy

Search blocks	**Search terms**
Care home terms	(institutional OR residential) NEXT/1 care
	(residential OR nursing OR 'health service' OR 'assisted living' OR 'extended care' OR 'aged care') NEXT/1 facilit*
	(care OR 'old age' OR nursing OR residential OR 'care-and-attention' OR 'dual registered') NEXT/1 home*
	((('long term' OR long*term) NEXT/1 care) AND (('long term' OR long*term) NEXT/2 facilit*))
	((('long term' OR long*term) NEXT/1 institution*) AND (('long term' OR long*term) NEXT/2 care))
	hostel*
Healthcare terms	physical NEXT/3 (health)
	(medical OR geriatric* OR specialist) NEXT/3 (care OR service* OR assessment*)
	(clinical NEXT/3 (care OR review)
	(primary OR secondary) NEXT/3 care)
Older people terms	old* NEXT/1 (people* OR person* OR adult* OR patient*)
	residents
	elder*

TABLE 3: Summary of studies of specialist healthcare support to care homes

[see Table attached]

TABLE 4: Models of healthcare support exemplified in the literature

Model name	**No. of interventions (papers)**	**Summary description of model**	**Evidence of effectiveness**
Assessment – No Consultant	15 (17)	Assessment only provided. Advice and/or direct training may be given to care home staff and/or recommendations may be made to residents' primary care physician, but there is no on-going management or support of residents.	Pharmacist's medication review of nursing home residents (Furniss *et al*., 2000) reduced the number of (inappropriate) medicines prescribed with associated cost reductions, with minimal impact on morbidity and mortality.
Assessment with Consultant	5 (5)	Assessment only provided as above but a senior responsible clinician ('consultant' level in UK, including Consultant Pharmacist) is part of the healthcare support team.	Specialist clinical pharmacology medication review (Ulfvarson *et al*., 2003) resulted in changed drug therapy to half of patients, with advice followed by responsible physician; no significant changes in resident's survival or outcomes.
Assessment/Management – No Consultant	25 (25)	Assessment and then on-going management of health/care of residents is provided but the team is not under the direction of a senior responsible clinician.	Pharmacy review led to appropriate medication changes, reduction in falls and no cost increases (Zermansky *et al*., 2006); Advanced Practice Nurses input resulted in less decline in residents' incontinence, pressure ulcers, and aggressive behaviour (Ryden *et al*., 2000).
Assessment/Management with Consultant	25 (32)	Assessment and management is provided as above but a senior responsible clinician ('consultant' level in UK, including Consultant Pharmacist) is part of the healthcare support team.	A multifactorial program to reduce falls and fall related injuries (Jensen *et al*., 2002), found a reduction in falls and femoral fractures in those receiving the intervention.
Training and Support	4 (4)	Support is to homes not individual residents. Support may be: training of care home staff, e.g. for fall and fracture prevention; or assisting in quality improvement efforts, e.g. a case note audit with feedback on appropriate care to be provided or liaison with regulators. However, the team do not assess or see individual residents.	An education initiative for care home staff demonstrated an increased awareness of the special needs of elderly residents with diabetes (Gallichan, 2002); A web-based tele-dermatology system in a nursing home was found useful for managing skin conditions (Janardhanan *et al*., 2008).
Total	74 (84)		

FIGURE 1: Study type decision tree

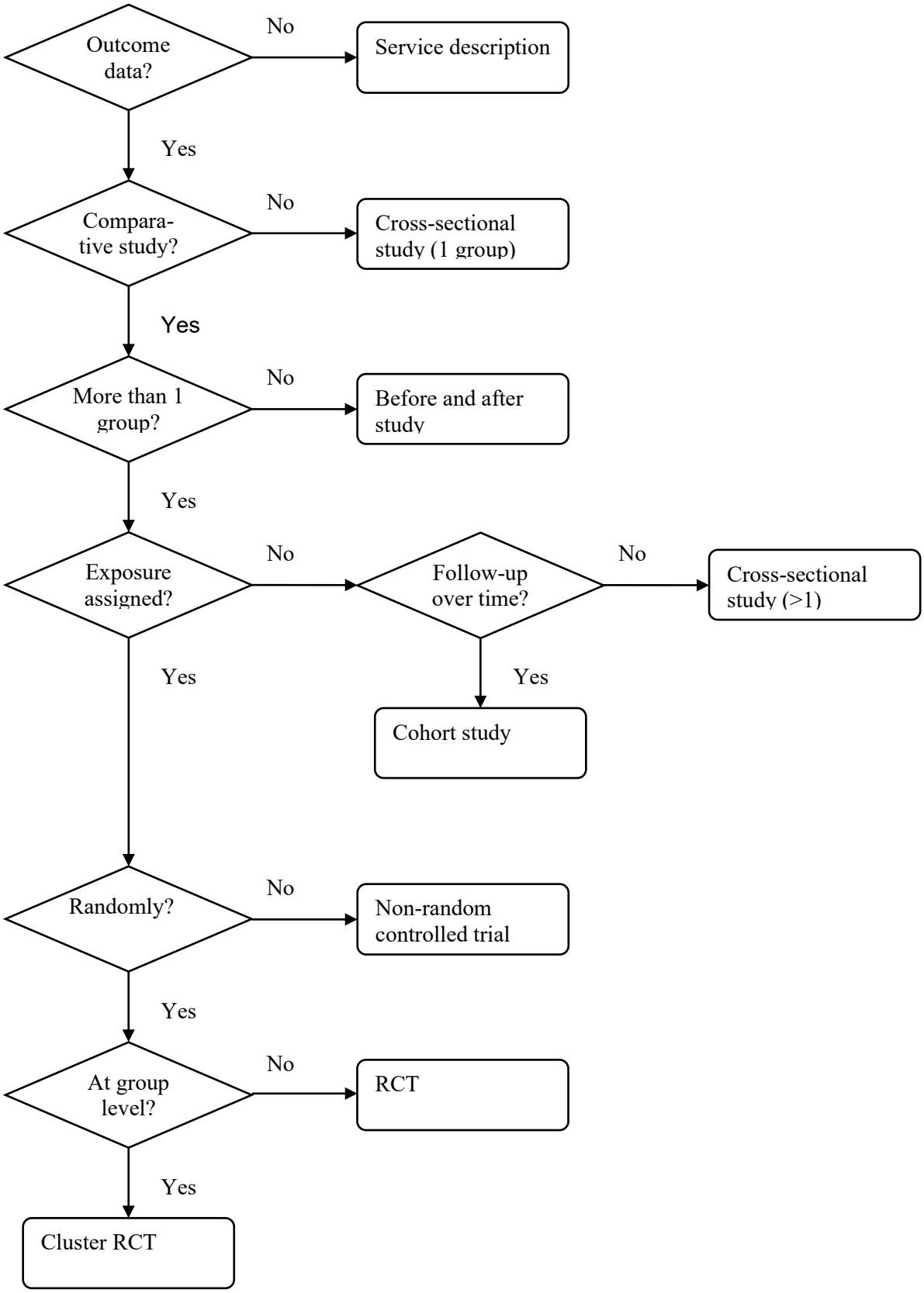

FIGURE 2: Literature search and study selection process