

Supplementary table 1. Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Content focused on CM in nursing	Published outside of the United States
Empirical studies, including qualitative studies, quantitative, and mixed methods studies	Editorial or commentary or policy documents or book or government document
Studies with CM development process	Review studies that included studies conducted outside of the United States
Conducted in the United States	Studies that do not describe CM interventions or role of NCMs
Studies published from 2007 to 2016	Studies in languages other than English
Published in peer-reviewed journals	
At least one registered nurse or nursing affiliation as an author	

Supplementary table 2. Themes in selected texts

Main themes	Subcategories	Original quotations in the texts
Weaknesses	no clear and consistent definition of CM	"[The] CM research . . . knowledge base has not kept up with definitions, distinctions" (Park & Huber, 2009, p. 175)
	lack of theoretical frameworks for CM	"Research has not produced a conceptual model for the NCM" (Gray & White, 2012, p. 3) "CM research has been criticized for its lack of theoretical foundation" (Park & Huber, 2009, p. 175)
	lack of precise dose of CM and standardized guidelines in CM practice	"Notwithstanding the call for dosage, little has been done to actually describe and test either nurse-sensitive or CM sensitive dosage" (Huber & Craig, 2007, p. 133) "Guidelines about who should provide it and when, where, and how frequently to use it need to be developed" (Baldwin et al., 2014, p. 154)
	lack of process measures	"Establishing a best method requires blending outcomes measures that feature service provision elements specific to the positive results that occur from actions case managers take on behalf of their clients with a configuration that can be translated into a financial formula" (Huber & Craig, 2007, p. 133) "A statistically validated tool is needed to help understand the acuity of the CM population" (Craig & Flaherty-Quemere, 2009, p. 186)
	limited reports of explicit role of NCMs and role confusion with NCMs	"There is a lack of empiric research on the specific structure, role definition, and role functions in case management" (Thomas, 2009, p. 30) "Nursing literature does not report significant investigation of the phenomena of role confusion in NCM" (Gray & White, 2012, p. 3)
Strengths	provided good transitional, patient-centered, and continuous care	"CM can be an effective care model for accountable, continuous, and patient-centered care in both hospital and community-based settings" (Joo, 2014, p. 826) "Care transitions can result in breakdown in continuity of care, resulting in increased preventable readmissions, particularly for indigent patient" (Baldwin et al., 2014, p. 148)
	applied to a variety of groups and a variety of settings effectively and efficiently	"Telephonic NCMs has the potential to facilitate patient receipt of evidence-based diabetes care while simultaneously helping the patient address behavioral health issues and navigate the healthcare system" (Kahn et al., 2009) "Community health nurses have long used case management interventions in working with diverse populations in various settings" (Wideman et al., 2008, p. 17)
	cost-effectiveness	"Although not statistically significant, the reduced hospital use resulted in cost savings of \$106 per patient per month in the IG" (Schraeder et al., 2008) "Telephonic follow-up reduced admissions and saved money for our hospital (Baldwin et al., 2014, p. 154)

Supplementary table 3. Characteristics of selected studies included in the scoping review

<b>Categories</b>	<b>Details</b>	<b>Total</b>	<b>Percentage (%)</b>
Design of studies	Experimental studies	7	27%
	Qualitative studies (Mixed method)	2	8%
	Descriptive studies	12	46%
	Secondary analysis studies	2	8%
	Concept analysis	1	3%
	others	2	8%
Sample of studies	Chronic illnesses	13	50%
	High risk patients (e.g., HIV, adolescent pregnant, etc)	5	19%
	NCMs or nurses or case mangers	6	23%
	Others	2	8%
Year of publication	2007–2009	12	46%
	2010–2012	8	31%
	2013–2016	6	23%

Supplementary table 4. Details of selected case management studies

Study	Sample	Design	Aims	Major findings (related to CM issues)
Baldwin et al. (2014)	Medicare beneficiaries	Quasi-experimental design	To decrease the number of preventable hospital and ED readmissions by providing telephonic CM run by a clinical nurse specialist	This CM project showed significant effectiveness in decreasing readmissions and resulted in lowered health-care costs. In the last 2 years, there have been a total of 22 less than 30-day readmissions to the ED or hospital in 13 patients, a significant decrease from readmissions in these patients prior to the program.
Bonaiuto (2007)	Students in a large southeastern urban school district with chronic health conditions and health issues that may interfere with learning	Retrospective design	To reduce health-related barriers to learning; enhance students' ability to benefit from their educational programs; and to test an impact of school nurse CM on attendance, behavior, academic performance, quality of life, and health compliance	This project demonstrated the benefits of school nurse CM in improving students' (a) attendance, (b) behavior, (c) academic performance, (d) quality of life, and (e) health compliance. In the 4 years of this project, 84% of the students' cases improved in 1 or more of the 5 target areas.
Brennan-Ing et al. (2016)	HIV clients in New York State	Retrospective study	To understand the impact of CM on outcomes	Target CM was able to achieve its goals of improving care engagement and treatment adherence to HIV.
Breysse et al. (2011)	Asthmatic children	RCT	To test the impact of nurse CM services and housing interventions on dust loadings and on allergen concentrations in homes	Individual action plan and tailored CM services such as referral services, home visits, and education by NCMs were provided to the IG. IG showed significant decreases in dust loading ( $p<0.001$ ) from baseline to post-intervention compared to CG.

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Craig & Flaherty-Quemere (2009)	Case managers	Descriptive study	To develop and test a tool for acuity of CM by quantifying the weights of case managers' caseloads and analyze the data to ensure that the correct populations are being targeted for CM	The developed tool was validated to a high degree of concordance. Acuity-based tools are able to assess the severity, intensity, and complexity of CM caseloads. To assess consistency of judgment among case managers, CM organizations can implement a formal testing methodology to evaluate the level of clinical assessment reliability and establish training protocols.
Gary et al. (2009)	Low-income African Americans with type 2 diabetes	RCT	To test the effects of a culturally tailored CM intervention with NCMs and community health workers in ER visits	After 24 months of intervention, IG that engaged in CM showed 23% fewer ER visits than the CG. At the 36-month follow-up, IG was 20% less likely to have ED visits and 21% less likely to be hospitalized than CG.
Gray & White (2012)	NCMs	Concept-analysis	To analyze the concept of role confusion as it pertains to NCMs	Role confusion occurs when there is no clear set of expectations for the NCM. Nursing literature does not report significant investigation of the phenomena of role confusion in NCM. This identified skill set would communicate the exact expectations of the position and would serve as a universal guideline for NCMs in all practice settings. NCMs need to have a clear understanding of their patient-centered roles to assure quality health-care delivery.
Grover et al. (2010)	Frequent ED users at a community hospital	Retrospective study	To determine if CM is an effective means of decreasing both frequency of ED use and radiation exposure	In the six months before enrollment, patients averaged 2.3 ED visits and 26.6 CT images per patient per month. In the six months after enrollment, patients averaged 0.6 ED visits per patient per month ( $p<0.0001$ ) and 10.2 CT images per patient per month ( $p=0.001$ ). CM can significantly reduce ED use by frequent users, and can also decrease radiation exposure from diagnostic imaging.

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Herleman (2008)	Home care primary nurses	Descriptive study	To describe the importance of having a structured CM model	A CM model is able to provide much-needed structure, decrease unnecessary time, effort, and frustration, and result in personal satisfaction for accomplishments that serve as rewards for choosing the profession of home care nursing.
Herrin et al. (2007)	Medicare diabetes patients	RCT	To investigate whether the CM model impacted the cost of diabetes care from the Medicare perspective	No significant difference in cost-effectiveness with diabetes was found after adjusting for baseline differences between intervention arms, claims-based audit and feedback, claims- and medical-record-based audit and feedback, and claims- and medical-record-based audit and feedback plus a practice-based diabetes resource nurse. No improvement in either clinical quality or in costs associated with diabetes was found from a Medicare perspective.
Howenstein et al. (2012)	ED nurses and ED case managers	Descriptive study	To identify and describe roles and responsibilities of the case managers	ED case managers are an essential asset in the ER for coordinating care, ensuring quality care, and improving patient and staff satisfaction.
Huber & Craig (2007)	-	Descriptive study	To introduce the CM dosage model, apply the CM Acuity Tool, translate this model into evidence-based practice	Positive results generated approval from an expert review panel to apply the CM Acuity Tool to the initial draft phase, the test population phase, and a national CM organization level.
Ishani et al. (2011)	Patients with diabetes and hypertension	RCT	To determine whether NCMs with a therapeutic algorithm could effectively improve rates of control for hypertension, hyperglycemia, and hyperlipidemia compared with usual care group	In patients with diabetes, NCMs using a treatment algorithm can effectively control of multiple cardiovascular risk factors at 1 year. IG showed HbA1c <8.0% (73.7 vs. 65.8%, $p=0.04$ ) and BP < 130/80 mmHg (45.0 vs. 25.4%, $p<0.01$ ), but not for LDL <100 mg/dL (57.6 vs. 55.4%, $p=0.61$ ), compared with those in the CG.
Issel et al. (2015)	Pregnant adolescents and adults	Secondary analysis	To characterize differences between pregnant adolescents and adults in the types of problems addressed by case managers and to assess subsequent differences in the types of interventions used with both groups	Case managers spent significantly more time per encounter with adolescents than with adults overall (mean 56.6 versus 50.3 min), and on educating, assessing, coaching, and monitoring. With respect to breadth of interventions, adolescent clients were significantly more likely to receive support, clinical interventions, and to tangible items compared to adult clients.

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Joo (2014)	Medicare beneficiaries with chronic illnesses in a community-based CM service in the Midwest	Secondary analysis	To evaluate the effectiveness of a community-based CM intervention on patient outcomes	A CM intervention had significant effect in reducing patients' number of hospitalizations, increasing patients' symptom control, and improving quality of life. The impact of CM on length of stay and emergency department visits was indeterminate.
Kahn et al. (2009)	Medicaid patients with diabetes and mental illnesses	Qualitative study	To identify issues faced by patients with co-morbid behavioral health diagnoses and diabetes as documented in a telephonic NCM's progress notes and to explore the role of the telephonic NCM in addressing patients' needs	Patients' appreciation for the efforts of the telephonic NCM evoked a sense of social isolation. CM intervention has the potential to facilitate patient receipt of evidence-based diabetes care while simultaneously helping the patient address behavioral health issues and navigate the healthcare system.
Kneipp et al. (2011)	Women with chronic health conditions receiving Temporary Assistance for Needy Families (TANF)	RCT	To evaluate the public health nursing CM ability to increase health care visits, improve Medicaid knowledge and skills, and improve health and functional status	After 9 months of CM intervention, effectiveness was shown in increasing health care visit rates for mental health, reducing depressive symptoms ( $p=0.016$ ), and improving functional status among members of the IG.
Lillquist (2008)	Breast cancer screening partnerships in New York State	Cross-sectional descriptive study	To improve understanding of CM in a new and distinct practice setting	Having a nurse as the case manager, being aware of the standards of CM, and providing health education were associated with both task focus and self-identity focus.
O'Hearn Ulch & Schmidt (2013)	Chronically ill Medicare beneficiaries	Retrospective design	To introduce the Community-Based Case Management program (CBCM), which was developed in response to managed care for the purpose of coordinating and reducing cost of care and to demonstrate the needs of advanced practice community-based NCMs.	The CBCM reduced ED visits, hospital admission rates, and inpatient days.
Park & Huber (2009)	Certified case managers	Secondary analysis	To investigate and compare characteristics of the CM workforce in the US by age, years of experience, and	Job titles and work settings of were diverse. Majority of CCMs' discipline was nursing (93.3%). Job title of

Study	Sample	Design	Aims	Major findings (related to CM issues)
			original profession	CCMs varied depending on clients' need. Lack of certified case managers still exist.
Schraeder et al. (2008)	Community-dwelling chronically ill older persons	Quasi-experimental design	To test the effectiveness of a collaborative primary care NCM intervention and transitional care on health-care utilization and cost	After 36 months, there were no significant differences between the IG and CG in the percentage of patients hospitalized or number of ED visits. However, rehospitalizations were significantly reduced in IG by 34% ( $p=0.032$ ). Although not statistically significant, the reduced hospital use resulted in cost savings of \$106 per patient per month.
Tahan et al. (2015)	Case managers	Cross-sectional descriptive study	To identify the essential activities, profile, and necessary knowledge areas for effective case manager practice from the perspective of those currently functioning in various care settings	The study identified the common activities and knowledge areas necessary for competent and effective performance of case managers. This study profiled case managers in the United States: 89% of case managers are registered professional nurses, 44.5% hold a bachelor's degree, 89% have the CCM credential.
Thomas (2009)	Patients admitted to and discharged from medical, surgical, neurology, and cardiology units	Causal-comparative design	To examined the effect of CM delivery models on the organizational outcomes of length of stay and payment denials	Caseload distribution and role definition had a statistically significant impact on LOS and denial management across clinical specialty units and levels of care. The role of the CMs predicted 11% of the organization's LOS management.
Wideman et al. (2008)	Underserved populations	Descriptive study	To evaluate and describe the implementation of a nursing CM model and outline barriers for implementing a nursing CM model	The study found evidence of effectiveness of use the nursing CM model. Outcomes include a significant increase in acute care referral follow-through and an increase in residents accessing participants' health preventative services.
Wise et al. (2011)	African American families	Action research	To describe how telephonic CM with comprehensive online asthma education was proposed to participants	This study discussed and applied asthma CM and education programs to continuously adjust originally proposed protocols through the planning and implementation phases and a higher proportion of low-income African American families are recruited

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Wolber & Ward (2010)	Patients with diabetes in a primary care practice	Mixed-method	To evaluate the design and implementation of a diabetes nurse CM program	<p>into the study. As a result, a higher proportion of low-income African American families are recruited into the study than originally proposed</p> <p>This study identified a promising CM model for training and modeling nurse CM program in a primary care setting. Key attributes necessary for successful implementation include embracing principles of redesign at all levels, access to a central data base and electronic medical records for time efficiency, constant redistribution of tasks among team members, continuous constructive feedback to reach nurse competency, and a frank discussion of nursing scope of practice and autonomy.</p>

Note. CG = control group; CM = case management; CCM = certified case manager; ED = emergency department; LOS = length of stay; NCMs = nurse case managers; RCT = randomized controlled trial, CG = control group; CBCM = community-based case management program; CCM = certified case manager; IG = intervention group; LOS = length of stay; NCMs = nurse case managers

Supplementary table 5. Selected definitions of case management

Associations	Concept	Definition
ANA	Nursing CM	Nursing CM is a dynamic and systematic collaborative approach to providing and coordinating healthcare services to a defined population. It is a participative process to identify and facilitate options and services for meeting individuals' health needs, while decreasing fragmentation and duplication of care, and enhancing quality, cost-effective clinical outcomes (Llewelyn & Leonard, 2009, p. 12)
CCMC	CM	CM is a collaborative process that assesses, plans, implements, coordinates, monitors, and evaluates the options and services required to meet the client's health and human service needs. It is characterized by advocacy, communication, and resource management and promotes quality and cost-effective interventions and outcomes (CCMC, 2017).
CMSA	CM	CM is a collaborative process of assessment, planning, facilitation, care coordination, evaluation, and advocacy for options and services to meet an individual's and family's comprehensive health needs through communication and available resources to promote quality, cost-effective outcomes (CMSA, 2017)

Note. ANA = American Nurses Association; CCMC = Commission for Case Manager Certification; CM = case management; CMSA = Case Management Society of America