Appendix S4: The overall impact of APN roles within APN-led models of care for young and middle-aged adult patients with multimorbidity and/or complex chronic conditions in hospital settings

Clinical Outcomes				
Authors (Year)	Readmission	Emergency Department Visits	Measurements	Laboratory findings
Allen et al. (2002)	Not Reported (NR)	NR	NR	Significantly more patients in the Partnership of Nurse Practitioner, primary providers and/or cardiologist (NP-MD) group than in the primary providers and/or cardiologist (EUC) group achieved a low-density lipoprotein cholesterol level (LDL-C) <2.59 mmol/dL (100 mg/dL, 65% vs. 35%, P = .0001) after one year. The mean high-density lipoprotein cholesterol (HDL-C) level increased slightly in both groups.
Hirschman & Bixby (2014)	No readmission	Once	NR	Hemoglobin A 1c (HbA1c) was < 7% after 6 months
Li et al. (2017)	NR	NR	NR	Significant decrease in HbA1c values at 3 months post-intervention from 8.0% (SD=1. 2) to 6.9% (SD=0.7), p=0.002. Low-density lipoprotein (LDL) showed a significant decrease at 3 months from 1.7 mmol/L (SD=0.7) to 1.1 mmol /L (SD=0.6), p=0.011. High-density lipoprotein (HDL) levels showed to have had a mildly lower trend.
Litaker et al (2003)	NR	NR	By the end of the study, no significant differences were found between the two groups in achieving the nationally recognized treatment goals for blood pressure. The average group mean arterial pressure (MAP) slopes throughout the study did not differ statistically between the study groups (p=0.16).	Significant improvements in the intervention group in mean HbA1c (70.7%, p=0.02) and HDL-c (+2.6 mg dL71, p= 0.02). After withdrawal from the study, a rapid return of mean HbA1c to pre-study levels was observed in those who had previously been treated by the Nurse Practitioner - Physician (NP-MD) team. The effect of team management on diabetes control disappeared within 12 months after the end of the study.
Zimmermann et al. (2017)	NR	NR	NR	NR

Patient Outcomes								
Authors (Year)	Preventive Care	Patient education	General Satisfaction with care	Quality of Life	General Health Status	Nutrition Status	Physical Activity	Drug intake, compliance and adherence
Allen et al. (2002)	NR	NR	The change in general satisfaction with care was significantly higher in patients treated by the Nurse Practitioner-Physician (NP-MD) team (+6.2 vs. 71.7 points, p=0.01). Similarly, two subscales of satisfaction, communication with the care provider (+3.9 vs. 73.0 points, p=0.03) and interpersonal care (+4.4 vs. + 1.9, p= 0.02), were also significantly higher at the end of the first year compared to baseline.	NR	NR	Significant improvement in dietary habits, compared to patients in the primary providers and/or cardiologist (EUC) group, patients in the Nurse Practitioner-Physician (NP-MD) group reported a greater reduction in calorie consumption from total fat (P = 0.0004), saturated fat (P = 0.0004) and cholesterol (P = 0.02) and a trend towards a greater increase in dietary fiber (P = 0.13), while calorie intake was similar. No significant changes in Body Mass Index (BMI) in either group.	A significantly higher proportion of patients in the NP-MD group (40%) reported exercising 6 metabolic equivalent (MET) hours per week compared to patients in the EUC group (26%, P = .02).	After one year, 87% of patients in the NP-MD group and 79% of patients in the EUC group had taken lipid-lowering medication. Of the patients receiving pharmacotherapy, 97% in both groups were taking a single statin. Belonging to the NP-MD group (P = .0001) and taking a lipid-lowering drug (P = .001) were significant independent predictors of LDL-C levels.
Hirschman & Bixby (2014)	NR	NR	NR	NR	NR	NR	NR	NR
Li et al.	NR	NR	NR	The median overall	Overall, no	NR	NR	NR

(2017)				impact score of the Audit of Diabetes-Dependent Quality of Life (ADDQoL) improved from -1.4 to -0.4 at follow-up, p = 0.0003.	significant changes in Diabetes Treatment Satisfaction Questionnaires (DTSQ) scores were seen.			
Litaker et al (2003)	Preventive care ordered and received was significantly higher for patients in the NP-MD team-treated group.	NP-MD team-treated patients had more teaching on a wide range of relevant topics.	NR	NR	NR	NR	NR	NR
Zimmermann et al. (2017)	NR	NR	NR	Increase in Quality of life (QoL) after 2 months in groups 2 and 4. Changes in the average EUROQol-5D (EQ-5D) scores were lower in groups 1 and 3. After 6 months, the intention-to-treat (ITT) intervention groups 2, 4 and 3 showed improvement in QoL compared to baseline compared to UC. Only in group 1 the average scores decrease compared to usual care (UC). At baseline, home-based care transitions intervention (HBCTI) patients with low activation tended to have poorer quality of life	After 2 months, the overall health status in group 4 improved from baseline to follow-up compared to the changes in health status of patients in the UC groups. Group 1 had the greatest decline in health status compared to UC. After 6 months, groups 2, 3 and 4 had better health status than the UC patients. Group 4's EQ-5D scores increased from 0.76 at baseline to 0.82 at 6-month	NR	NR	NR

System Outcomes								
				(QoL) than patients with high activation, both in the intervention and UC groups. Group 3 had an average EQ-5D score of 0.58 compared to Group 4 with an average score of 0.76, a difference of 24%.	follow-up, compared to a slight increase from 0.767 to 0.771 for UC. In group 1, the health status worsened compared to UC.			

Authors (year)	Cost effectiveness analysis	Health Care Expenditures (Emergency department visits and inpatient admissions)	Average of visits and Estimated Time during visits
Allen et al. (2002)	NR	NR	Estimated time spent with patients demonstrated significant differences. Patients assigned to the NP-MD team had an average contact time of 180 min throughout 1 year follow up vs. 85 min for those in the usual care group ($p < 0.001$). Median number of visits for outpatient management of hypertension or diabetes mellitus was significantly higher for NP-MD team-treated patients (Mann– Whitney U=1,841, $p < 0.001$).
Hirschman & Bixby (2014)	NR	NR	
Li et al. (2017)	NR	NR	
Litaker et al. (2003)	Average personnel costs per patient for 1 year's treatment were significantly higher and amounted to $134.68 for team-treated patients and $93.70 for those treated by their primary care provider (PCP) alone (md=$40.38, $p > 0.001$). The total additional personnel costs associated with this program were nearly 50% higher than for the usual approach to providing care ($10,639.70 vs. $7,308.53).	NR	
Zimmermann et al. (2017)	At 2-month Group 1 and 3 were not cost-effective. The intervention activities to Group 2 and 4 were cost-effective; the Incremental Cost-Effectiveness Ratio (ICER) was US$3,510 for the ITT Group 4 and the ICER was US$14,853 at 2 months. The intervention was cost-effective for all groups except Group 1 after 6 months. ICERs ranged from US$3,510 for Group 4 to US$22,520 for Group 3. Overall, the intention-to-treat (ITT) groups at both follow-up periods, the intervention for Group 4 was the most cost-effective. In the home-based care transitions intervention (HBCTI) patients who completed the scheduled intervention, the intervention Group 4 had a positive ICER after 2 months (US$3,309). The intervention was not cost-effective for Groups 1, 2, or 3 at 2-month follow-up. However, at 6-month follow-up, the intervention was cost-effective for all groups except for Group 1, which had a negative ICER of US$5,305. The intervention for Group 4 remained the most cost effective among	At 2-month follow-up, Group 1 and Group 4 had lower average health care expenditures than usual care (UC). There were no health care expenditures for either the intervention or UC patients in Groups 2 and 3 at 2-month follow-up. At the longer 6-month follow-up period, Group 1 and Group 3 had higher health care expenditures than UC. In contrast, Group 2 and Group 4 experienced lower expenditures relative to UC at 6 months. The findings were similar for both ITT and HBCTI patients.	

	all groups for both follow-up periods.		