

COMPILATION OF REFERENCED STUDIES

3



PART 3 COMPILATION OF REFERENCED STUDIES

INTRODUCTION	20
PURPOSE	20
SELECTION CRITERIA	20
PERIODICITY	20
ABBREVIATIONS	21
TABLE 1: CONGESTIVE HEART FAILURE	22
TABLE 2: CHRONIC OBSTRUCTIVE PULMONARY DISEASE	26
TABLE 3: DIABETES	28
TABLE 4: MULTIPLE CHRONIC DISEASES	29

INTRODUCTION

COCIR has established a dedicated Focus Group on telemedicine to respond to the many questions and doubts remaining about telemedicine.

COCIR defines telemedicine as the delivery of healthcare services through the use of Information and Communication Technologies (ICT) in a situation where the actors are not at the same location. The actors can either be two healthcare professionals (e.g. teleradiology, telesurgery) or a health care professional and a patient (e.g. telemonitoring of chronically ill such as those with diabetes and heart conditions, telepsychiatry etc).

Telemedicine includes all areas where medical or social data is being sent/exchanged between at least two remote locations, including both caregiver-patient/citizen as well as doc-to-doc communication.

PURPOSES

Although an increasing number of studies and clinical trials demonstrate the effectiveness of telemedicine solutions, many clinicians, patients and payers, partially question the evidence available and do not trust telemedicine applications to support and improve the delivery of good quality healthcare. This lack of confidence is also a barrier to the integration of telemedicine in healthcare infrastructure and to the reimbursement of telemedicine services by health insurance companies.

This lack of trust is based on the fact that the results of existing studies are only partly known and many of the results are not directly comparable, because of the size, duration or overall design of the respective studies.

To address this situation, COCIR has started to collect and summarise the peer reviewed evidence of telemedicine projects and studies to support consistent communication on the quality of care and cost-effectiveness of Telemedicine solutions.

CRITERIA

The references that are listed below are all completed and published relevant studies in well-known scientific publications.

PERIODICITY

This database is a living document. It will be updated with new studies on a regular basis.

ABBREVIATIONS

BDOC	... Bed Days Of Care
CCQ	... Clinical COPD Questionnaire (measure of HRQoL)
CHF	... Congestive Heart Failure
COPD	... Chronic Obstructive Pulmonary Disease
ECG	... Electrocardiogram
ECOPD	... Exacerbations of chronic obstructive pulmonary disease
ER	... Emergency Room
GP	... General Physician
HF	... Heart Failure
HHA	... Home Health Agencies
HRQoL	... Health Related Quality of Life
HTM	... Home Telemonitoring
LVEF	... Left Ventricular Ejection Fraction
NYHA	... New York Heart Association (NYHA) functional classification (extent of heart failure)
RCT	... Randomised Controlled Trial
SGRQ	... St George's Respiratory Questionnaire
TM	... Telemonitoring
TVC	... Telemedicine Video Control
UC	... Usual Care

TABLE 1 CONGESTIVE HEART FAILURE

REFERENCE OF STUDY	STUDY TYPE	PATIENTS POPULATION	STUDY DURATION	STUDY OUTCOME	TYPE OF INTERVENTION	LINK
Domingo M, et al., Evaluation of a telemedicine system for heart failure patients: feasibility, acceptance rate, satisfaction and changes in behaviour. Results from the CARME study. Eur J Cardiovasc Nurs (2011), doi: 10.1016/j.ejcnurse.2011.02.003	Prospective intervention study	97 patients (out of 211 screened)	1 year follow up	<ul style="list-style-type: none"> • Telemonitoring resulted in positive changes in patients behaviour: • High compliance in responding to the questionnaire (88%) • Good compliance with self-monitoring of weight (76%) and blood pressure (72%) • High satisfaction of patients and nurses with the system: after the study 65% of patients wished to continue the telemonitoring, especially group B patients. 	<ul style="list-style-type: none"> • All patients used the Motiva systems: an interactive telemedicine platform in a multidisciplinary heart failure unit at a university hospital which uses educational videos, motivational messages, questionnaires. • All patients were sent 20 educational videos and 25 different questionnaires on physical activity, nutrition, symptoms, etc. • Group A used only Motiva system and group B used Motiva system and self-monitoring tools. 	
Inglis et al., Structured telephone support or telemonitoring programmes for patients with chronic heart failure. Cochrane Database of Systematic Reviews 2010, Issue 8. Art. No.: CD007228	<ul style="list-style-type: none"> • Systematic review of 25 peer reviewed published RCTs and five published abstracts. 	Various	Various	<ul style="list-style-type: none"> • Telemonitoring reduced all-cause mortality (RR 0.66, 95% CI 0.54 to 0.81, P < 0.0001) effect (RR 0.88, 95% CI 0.76 to 1.01, P = 0.08). • Both structured telephone support (RR 0.77, 95% CI 0.68 to 0.87, P < 0.0001) and telemonitoring (RR 0.79, 95% CI 0.67 to 0.94, P = 0.008) reduced CHF-related hospitalisations. • For both interventions, several studies improved quality of life, reduced healthcare costs and were acceptable to patients. • Improvements in prescribing, patient knowledge and self-care, and New York Heart Association (NYHA) functional class were observed 	Comparison of telephone support or telemonitoring with usual care.	
Polisena et al., Home telemonitoring for congestive heart failure: a systematic review and meta-analysis J Telemed Telecare 2010, 1-8	<ul style="list-style-type: none"> • Systematic review and meta-analysis of 21 RCTs and observational studies. • These studies compared telemonitoring, telephone support and usual care. 	<ul style="list-style-type: none"> • median age > 55 	Between 30 days to one year - depending on the study	<ul style="list-style-type: none"> • Lower risk of death in telemedicine group (risk ratio=0,64; 95% CI:0,48-0,85). • Increased primary care visits, specialist visits and homecare visits for the telemedicine group. • Studies suggested that telemedicine helped to lower the number of hospitalisations and the use of other health services. • Studies suggested patient quality of life and satisfaction with telemonitoring were similar or better than with usual care. 	Comparison of telephone support or telemonitoring with usual care.	
Polisena et al., Home telemonitoring for congestive heart failure: a systematic review and meta-analysis J Telemed Telecare 2010, 1-8	<ul style="list-style-type: none"> • Systematic review and meta-analysis of 21 RCTs and observational studies. 	<ul style="list-style-type: none"> • median age > 55 	Between 30 days to one year - depending on the study	<ul style="list-style-type: none"> • Lower risk of death in telemedicine group (risk ratio=0,64; 95% CI:0,48-0,85). • Increased primary care visits, specialist visits and homecare visits for the telemedicine group. • Studies suggested that telemedicine helped to lower the number of hospitalisations and the use of other health services. • Studies suggested patient quality of life and satisfaction with telemonitoring were similar or better than with usual care. 	Comparison of telephone support or telemonitoring with usual care.	

TABLE 1 CONGESTIVE HEART FAILURE FOLLOWING

REFERENCE OF STUDY	STUDY TYPE	PATIENTS POPULATION	STUDY DURATION	STUDY OUTCOME	TYPE OF INTERVENTION	LINK
Chaudhry et al. , Telemonitoring in Patients with Heart Failure. The New England Journal of Medicine, 2010, 363;24.	Multicenter RCT	<ul style="list-style-type: none"> • 1653 patients who had recently been hospitalised for heart failure. • 826 patients assigned to telemedicine; 827 patients assigned to usual care. • Median age of patients: 61 years old: 42% female and 39% black. 	2006-2009	<ul style="list-style-type: none"> • The outcomes for telemonitoring group and the usual care group did not differ significantly. • Readmission for any reason occurred in 49.3% of the telemonitoring group and 47.4% of the usual care group. • Death occurred in 11.1% of the telemonitoring group and 11.4% of the usual care group. • Low adherence to the programme probably due to the method used (answering machine): • 14% of patients assigned to the telemonitoring group never used the system. • By the end of the study period, only 55% of patients were still using the system • 21% of patients did not complete the final telephone interview at 6 months. 	<ul style="list-style-type: none"> • Telemonitoring was accomplished by means of a telephone-based interactive voice-response system that collected information about symptoms and weight that was reviewed by the patients' clinicians. • Primary end point: readmission for any reason or death within 180 days after enrollment. • Secondary end point: readmission for heart failure, number of days in hospitals, and number of hospitalisations. 	
D. Owais et al. , A randomized trial of home telemonitoring in a typical elderly heart failure population in North West London: results of the Home-HF study. European Journal of Heart Failure 11 (2009): 319-325.	Multicenter RCT	<ul style="list-style-type: none"> • 182 typical heart failure patients discharged from three acute hospitals. • 50% of patients assigned to telemedicine and 50% patients assigned to usual follow up care. • Mean age of patients: 70 yr 	<ul style="list-style-type: none"> • July 2006-August 2007 • 6 months follow up. 	<ul style="list-style-type: none"> • Excellent compliance with daily monitoring (95% of telemonitoring patients used the monitoring equipment for at least 90% of the study duration). • No difference in the median number of days alive or out of hospital between the two groups. • For those hospitalised, no difference between number of days spent in hospital between the two groups. • More emergency heart failure admissions in the usual care group (81 % of patients) compared to the telemedicine group (36% of patients). • Reduction in the number of secondary care outpatient visits and reduction in emergency rooms visits in the telemonitoring group. 	<ul style="list-style-type: none"> • All patients received an initial home visit by a nurse and received advice on self-monitoring of heart failure. • Telemedicine group received in addition a monitoring device, and were taught how to use it. Transmitted data (weight, blood pressure, heart rate and oxygen saturation) was reviewed daily by a heart failure nurse. If any deviation of vital signs, Telemedicine patients received advice. 	http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2645059/
Giordano et al. (2009) Multicenter randomised trial on home-based telemanagement to prevent hospital readmission of patients with chronic heart failure. Int J Cardiol;131:192-9	multicenter (n=5) RCT	460 patients randomized 1:1 to UC (n=230) or TM (n=230) Diagnosis of CHF, left ventricular ejection fraction (LVEF) <40%, at least one hospitalization for acute HF in the previous year, clinically stable: symptomatically improved, without intravenous therapy for at least 7 days, stable oral therapy (maximally tolerated doses of angiotensinrenin inhibitor and beta-blocker, no dose change for 5 days) and stable weight(no change >1Kg).	one year follow up	<ul style="list-style-type: none"> • Primary Outcome: significantly lower risk of heart failure related readmission - 50% (TM:n=43, UC:n= 73, p=0,0001), • Secondary Outcome:- 55% reduction in cardiovascular mortality (p= 0,06), 31 % decrease in episodes of hemodynamic instability (TM: 101 episodes, UC: 147 episodes, p< 0,001), mean cost of hospital readmission 35% lower in TM-group (TM: €843+/-1733, UC: €1298+/-2322, p=0,01) 	All patients: education about HF, advice on daily weight, self-measurement of blood pressure, rate of carrying out blood examinations, dietary restrictions, signs and symptoms of a heart failure decompensation. UC: referral to their primary care physician TM: portable advice (Card-Guard 2206) transferring from a fixed or mobile phone, one-lead-trace to a receiving station with a doctor or nurse available 24 h, 7 days/week. scheduled appointments every week or every 15 days Nerve Center: 4 Hewlett Packard server, WEB server, firewall , computerized call center 15 IAN workstations. Technological and organizational support. 5 Centers: Terminals linked with the call center, configured to share the application programme interface of the Central Station with On line license. Management of clinical activity. Cardiologist and nurse: meeting once a week to sum up the course of the patients	
Mortara et al. (2009) Home telemonitoring in heart failure patients: the HHH study (Home or Hospital in Heart Failure). Eur J Heart Fail; 11(3):312-8	Multinational, multicentre, randomized controlled clinical trial, additional post hoc test Setting: UK, Poland, Italy	416 patients, randomized (1:2) to usual care (n=160) or TM(n=301); 18<age<85; NYHA II-IV aetiology:ischaemic, idiopathic, hypertensive, or valvular <40%; abnormal diastolic echocardiographic pattern from E/A<1;hospital admission in the previous 12 month;optimized medical therapy	12 month follow up	<ul style="list-style-type: none"> • Feasibility: 92 % practical recordings (of 1630/2078), compliance unrelated to NYHA (p = 0.1) or older age (p = 0,25) • Efficacy: (p= 0,5) no significant effect in reducing bed days occupancy, cardiac death plus hospitalization or number of re- hospitalizations • Post hoc: heterogenous effect in the countries in the number of hospitalizations and cardiac death + hospitalization. Italy has a 52% reduction of the combined endpoint death and CHF related hospital admission. Only about 10% cardiac mortality rate in both intervention and control group. 	3 strategies in the TM group; strategie 1 (n = 106): answering machine + nurse telephone contact, strategie 2 (n = 94) : answering machine + nurse telephone contact + weekly vital signs, strategie 3 (n= 101): answering machine + nurse telephone contact + weekly vital + NICRAM ;TM-groups : portable device to report ECG, respiration and physical activity over 24 h, additional reported symptoms, weight, heart rate, systolic blood pressure and unspecified blood test	

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REFERENCE OF STUDY	STUDY TYPE	PATIENTS POPULATION	STUDY DURATION	STUDY OUTCOME	TYPE OF INTERVENTION	LINK
Ramaekers et al. (2009): Adherence among telemonitored patients with heart failure to pharmacological and nonpharmacological recommendations. <i>Telemedicine & e-Health</i> ;15: 517-24	RCT; multicentric Setting: Telemonitoring via University of Maastricht (NL); Patients recruited from 3 Dutch hospitals and provided with usual care	101 patients	3 months follow-up	<ul style="list-style-type: none"> • Disease specific knowledge improved significantly in two of the three hospitals ($p < 0.001$ and $p = 0.040$). • Adherence in terms of fluid restrictions ($p = 0.012$), daily weighing ($p < 0.001$), physical exercising ($p = 0.034$), and alcohol restrictions ($p = 0.040$) improved significantly in the telemonitoring group; • Substantial but statistically not significant decrease in depression. 	Health Buddy CHF programme w/o additional peripherals	http://www.liebertonline.com/doi/abs/10.1089/tmj.2008.0160
Goernig et al. (2009) Ambulatory Disease Management in Cardiac Patients: 12 month follow-up of Home Care Telemedicine in Thuringia by the Management Program Zertiva®. <i>Phys Rehab Kur Med</i> ; 19: 9-13	RCT	95 patients, 5 with suspected paroxysmale tachycardia, 90 with chronic heart failure; randomized to UC (n=90) and TM (n=90); at least one hospitalization for HF in the previous 6 month, members of one statutory health insurance	12 months	<ul style="list-style-type: none"> • No drop outs • Good compliance • Significant fewer hospitalizations -43% (UC: n=143, TM: n=62, $p = 0,001$) • 68% reduction of bed days of hospital care (UC:1328, TM:424, $p = 0,001$) • costs reduction -77% (UC:1371408€ TM: 317033€, $p = 0,001$) in the TM-group. 	TM: mobile 12 channel EC (Viapac TM from SHL)G, NYHA III patients additionally received a wage, pulse- and blood pressure measurement and transmitted vital parameters weight, blood pressure and pulse on daily base; Information material about pathophysiology, nutrition and animation; electronic patient record viewable for patients and physicians	
Soran et al. (2008) A Randomized Clinical Trial of the Clinical Effects of Enhanced Heart Failure Monitoring Using a Computer-Based Telephonic Monitoring System in Older Minorities and Women. <i>J Cardiac Fail</i> ;14:711-7	RCT	315 patients (1:1)	6 months follow up	<ul style="list-style-type: none"> • Reduction of combined endpoint cardiac mortality and CHF related hospital admission by 34% ($p = 0,083$) 		
Morguet et al. (2008) Impact of telemedical care and monitoring on morbidity in mild to moderate chronic heart failure. <i>Cardiology</i> ;111:134-9	RCT	128 patients (1:3), TM:n=32, UC: n=96, Ejection fraction > 60%, NYHA class II or III	300 days mean follow up	<ul style="list-style-type: none"> • All cause hospitalization duration (UC: 317, TM: 693 days/100 patients years, -54%, $p < 0,0001$) and rate (UC:38, TM:77 days/100 patients years, -51%, $p = 0,034$) as well as cardiac hospital • Admissions -69% and bed days of care -87%, (UC:379 TM :49 days/100 patients years, $p < 0,0001$) were significantly lower 	All patients: medical instruction about HF, pathophysiology basics, diet and physical exercise; biweekly scheduled telephone calls about symptoms, medication and quality of life TM: transmission of weight, blood pressure , pulse rate and when required a 12-lead ECG	
Kielblock et al. (2007) [Impact of telemetric management on overall treatment costs and mortality rate among patients with chronic heart failure] Einfluss einer telemedizinisch unterstützten Betreuung auf Behandlungskosten und Mortalität bei chronischer Herzinsuffizienz. <i>Dtsch Med Wochenschr</i> ;132:417-422	Non-randomized controlled comparison Setting: Disease Management Provider	2/05/2011	12 month mean follow up	<ul style="list-style-type: none"> • Primary outcome: Reduction of days in hospital: UC:49,1 - TM:25,3 (-48 %, $p = 0,01$) Reduction of hospital cases: UC: 3,4 - TM: 2 (-41%, $p = 0,01$) • Secondary outcome : Cost reduction of 39,5%: UC: 17446€ - TM:10563€ ($p = 0,05$), Return on investment: 3:1; Mortality in UC: 27,1%(n=69) - TM:14,7% (n=37) ($p = 0,001$); statistical significant difference between men and female in hospitalizations(F: 1,9 - M:N=2,1; $p = 0,03$)and costs(F: 9854€ - M:11090€; $p = 0,02$); medication in TM-Group increased: 10,2% total 	Heart failure service nurses and for special problems doctors, 20 learning lessons, construction of a medical 'data warehouse', TM-equipment: telemetric weight scale, weighing every day, automated transfer of these data to the medical datawarehouse. Reporting to patients and their physicians: every three month	

TABLE 1 CONGESTIVE HEART FAILURE FOLLOWING

REFERENCE OF STUDY	STUDY TYPE	PATIENTS POPULATION	STUDY DURATION	STUDY OUTCOME	TYPE OF INTERVENTION	LINK
Dansky et al. (2007) Impact of telehealth on clinical outcomes in patients with heart failure. Clinical Nursing Research; 17:182-99	Prospective randomized field experiment multicentre Setting: 10 home health agencies (HHA)	284 patients randomized (3:2) to UC or TM, primary or secondary diagnoses of heart failure, ability to communicate in English	Follow up 4 months	<ul style="list-style-type: none"> • Outcome measurement: Omaha System Problem rating Scale for Outcomes (PSO) number of home care was significantly correlated with several outcomes • Hospitalization: statistically significant fewer hospitalizations at 60 days; No statistically significance within group comparisons; • Emergency visits: fewer ED visits (60 days, TM: 24%, TM+Video: 18%, UC:30%; 120days, TM:30%, TM+Video: 31%, UC:36%, p=0,09) 	All patients: information on heart failure, providing basis facts on the disease, guidelines on self-management UC: routine home visits nurses and supervisors: training TM: One-way telemonitoring system: own measurements of blood pressure, pulse and weight through peripheral devices, transmitting to the HHA , every day at a predetermined time Two-way telemonitoring system: additional videocamera and digital stethoscope for interaction between nurse and patient, sessions scheduled by the home care nurse (2-3 times a week)	
John G. F. Cleland et al. Noninvasive Home Telemonitoring for Patients with Heart Failure at High Risk of Recurrent Admission and Death. The Trans-European Network-Home-Care Management System (TEN-HMS) Study - Journal of American College of Cardiology 2005;45:1654-64	Randomized controlled trial. Setting: Patients were recruited from twelve main and four satellite hospitals that did not have a comprehensive heart failure management organisation in place in Germany, the Netherlands and UK.	Enrollment criteria: Intervention group: 462, control group: 168. 48% were aged > 70yrs old. History of at least 1 hospital admission due to worsening heart failure lasting > 48hrs within the last 6 weeks, persisting symptoms of heart failure, LV ejection fraction <40%, In addition history of at least 1 unplanned cardiovascular admission lasting >48h within previous 2 years, and LV ejection fraction < 25%, or treatment with furosemide at a dose >100mg/day or equivalent.	First patient enrolled: August 2000. Last patient enrolled: March 2002. Follow up 450 days.	<ul style="list-style-type: none"> • Significant mortality reduction - 30% • Reduction in hospital length of stay – 25%. 	Twice-daily patient measurement of weight, blood pressure, heart rate and rhythm with automated devices linked to a cardiology center. The objective was to identify whether home telemonitoring (HTM) improves outcomes compared with nurses telephone support and usual care.	
Schofield et al. (2005): Early Outcomes of a Care Coordination-Enhanced Telehome Care Program for Elderly Veterans with Chronic Heart Failure. Telemedicine and eHealth, 11(1), 20-27.	Non-randomized non-controlled pre-post evaluations Setting: primary care providers of the Veterans Health Administration (USA)	73 patients, veterans with new onset systolic CHF (NYHA II-IV), mean LVEF 23%, mean age 67ys	6 months	<ul style="list-style-type: none"> • Vital signs: significant improvements in blood pressure (129m to 119/69 mm Hg, p < 0.05), weight (196 to 192 pounds, p < 0.01), and shortness of breath rate (0-10 scale, 4.0 to 2.7, P = 0.02); • Resource utilization: significant reduction for bed days of care 1.65 (+/- 5.4) per patient during the program versus 8.63 (+/- 9.6) during prior year, p < 0.001 	Care-coordinated, nurse-directed home telehealth management program with disease-specific education via the nurse coordinator and/or the Health Buddy and monitoring of symptoms, weight, blood pressure, heart rate.	http://www.liebertonline.com/doi/10.1089%2Ftmj.2005.11.20
Vaccaro et al. (2001): Utilization Reduction Cost Savings, and Return on Investment for the PacifiCare Chronic Heart Failure Program, 'Taking Charge of Your Heart Health.' Disease Management, 4(3), 131-141.	Non-randomized, matched cohort controlled comparison Setting: Primary care providers of the Veterans Health Administration (USA)	52 patients with moderate or severe CHF in intervention group, 1 inpatient admission or 3 ER visits for CHF in the prior year, 56 % male, median age above 75 years; matched cohort control group with 638 patients	Enrollment period from 8/99 through 10/99, follow-up of 6 months	<ul style="list-style-type: none"> • Inpatient hospitalizations for all causes: reduction by 1.29 to 0.65 per patient per year (-49.6 %), p<0.001; • ER visits for all causes: reduction by 0.63 to 0.17 per patient per year (-73%), p<0.001; • Estimated costs savings for hospitalizations and ER visits: \$5,271 per patient per year (-50.6%) 	Monitoring of symptoms via Health Buddy plus written educational material and monthly phone calls for education	http://www.liebertonline.com/doi/abs/10.1089/1093507015259605

TABLE 2 CHRONIC OBSTRUCTIVE PULMONARY DISEASE

REFERENCE OF STUDY	STUDY TYPE	PATIENTS POPULATION	STUDY DURATION	STUDY OUTCOME	TYPE OF INTERVENTION	LINK
Sorknaes AD et al.(2010) Nurse tele-consultations with discharged COPD patients reduce early readmissions - an interventional study, the Clinical Respiratory Journal.	Interventional study, not randomised	<ul style="list-style-type: none"> Intervention group: 52 patients, control group: 50 patients. Inclusion criteria: People who have been admitted to hospital for ECOPD (COPD with dyspnoea, more cough and/or more sputum and a need for increased medication). Exclusion criteria: <40 yrs, systolic blood pressure, other serious diseases (cancer or severe heart failure), communication problems, not able to use a phone... 	<ul style="list-style-type: none"> From 4 June 2007 to 15 March 2008 and from 8th August 2008 to 6 January 2009. 28 days follow up. 	<ul style="list-style-type: none"> Within the 28 days period, The TVC group showed a readmission rate for ECOPD of 12% whereas the control group showed a readmission rate for ECOPD of 22%, hence a difference of 10% in readmissions. Patient satisfaction was high. Conclusion: in a hospitalised population with ECOPD, a nurse TVC assignment is protective against early readmission and reduces the days of readmission. 	<ul style="list-style-type: none"> Interventional study in which all ECOPD (exacerbations of chronic obstructive pulmonary disease) were allocated into two groups (telemedicine video control (TVC) or control) depending on their home municipality. The TVC patient received daily TVC at home with a nurse based in hospital for approximately one week. Thereafter the patient received at least one follow-up call and they could call the nurse for the rest of the study period of 28 days. The telemedicine equipment was composed of a computer with a web camera, a microphone and measurement equipment. 	
Koff P et al. (2009): Proactive Integrated Care Reduces Critical Care and Improves Quality of Life in COPD, European Respiratory Journal 34 (Suppl. 53):p. 75s	RCT; monocentric, Setting: COPD and General Pulmonary Clinic at the University of Colorado Hospital	<ul style="list-style-type: none"> Intervention group: 270 patients Control group: 130 patients Inclusion Criteria: GOLD Class III and IV or FEV1 > 50% predicted with a recent exacerbation Exclusion Criteria: Asthma, Significant co-morbidities including HIV infection, interstitial lung disease, end-stage liver or renal disease or dementia <p>Diseases likely to result in death within 2 years, Exclusion Criteria: Asthma,</p>	<ul style="list-style-type: none"> 9 months follow-up Study period: 2006-07; enrollment 2 pt. per day 	<ul style="list-style-type: none"> Significant reduction in critical care utilizations Reduction in gross costs depending on differing hospital reimbursement rates (High Reimbursement Rate: -450\$ p.p.p.m., Middle: -210\$ p.p.p.m., Low: -150\$ p.p.p.m.); Significant improvements in health-related quality of life (measured with SGRQ), 6 min walk distance, oxygene saturation and shortness of breath; Decreased mortality (4 % vs. 1%, p=0.046) 	Proactive Integrated Care with disease-specific education, teaching of self-management techniques, enhanced communication and remote home monitoring with Health Buddy; monitoring from Monday to Friday for changes in symptoms, SpO ₂ , FEV1 and steps in 6 min walk test	http://www.ersnet.org/learning_resources_player/abstract_print_09/files/66.pdf
Vitacca et al. (2009) Tele-assistance in chronic respiratory failure patients: a randomized clinical trial. European Respiratory Journal; 33: 411-418	RCT, monocentric Setting: Italy	101 patients (57:44)	12 months	43% reduction of hospital admissions (0,17 vs 0,3 per patient per month) ; reduction of costs 52% (UC: 24743 Euro/Year vs. TM: 9886 + 2000 Euro (service/ devices))	<ul style="list-style-type: none"> Thereafter the patient received at least one follow-up call and they could call the nurse for the rest of the study period of 28 days. 	
Koff P et al. (2009): Proactive Integrated Care Improves Quality of Life in Patients with COPD. European Respiratory Journal,	RCT; monocentric Setting: COPD and General Pulmonary Clinic at the University of Colorado Hospital	Intervention group: 19 (mean age 67y), control group: 19 (age 65y); GOLD stage III and IV; no statistical significant baseline characteristics	First patient enrolled: Nov 2004; last patient enrolled: June 2005; follow-up 12 weeks; outcomes compared to prior 12 weeks	<ul style="list-style-type: none"> Quality of life (SGRQ): intervention) 10.3 points improved (19%), control) 0.6 points improved (1%), p=0.018; Costs: no statistical significant differences; Exacerbations and hospital admissions not analyzed Detection of exacerbations (9 vs. 2 patients) 	Proactive Integrated Care with disease-specific education, teaching of self-management techniques, enhanced communication and remote home monitoring with Health Buddy; monitoring from Monday to Friday for changes in symptoms, SpO ₂ , FEV1 and steps in 6 min walk test	http://erj.ersjournals.com/cgi/content/short/09031936.00063108v1

TABLE 2 CHRONIC OBSTRUCTIVE PULMONARY DISEASE FOLLOWING

REFERENCE OF STUDY	STUDY TYPE	PATIENTS POPULATION	STUDY DURATION	STUDY OUTCOME	TYPE OF INTERVENTION	LINK
Trappenburg J.C.A. et al. (2008): Effects of Telemonitoring in Patients with Chronic Obstructive Pulmonary Disease. Telemedicine and e-Health, 14(2), p. 138-146.	<ul style="list-style-type: none"> • Non-randomized controlled comparison • Multicenter 	Intervention group: 68 (mean age 69y), control group: 56 (age 70y); GOLD stage III and IV; history of at least 1 COPD exacerbation in the preceding 6 months; more exacerbations, outpatient visits and hospital admissions in intervention than in control at baseline	First patient enrolled: May 2004; last patient enrolled: August 2005; follow-up 6 months; outcomes compared to previous 6 months	<ul style="list-style-type: none"> • Rate of exacerbation: intervention group 1.0 -> 0.65 (-35 %), control group 0.69 -> 1.01 (+46 %), p=0.004; • Rate of hospitalization: intervention 0.76 -> 0.65 (-15 %), control 0.48 -> 0.75 (+ 56 %), p=0.02; quality of life (CCQ): no statistical significant differences 	Health Buddy intervention with daily questions to patients that both monitor their disease symptoms, medication compliance, and knowledge; and provide education about their condition; answers reviewed from Monday to Friday by respiratory nurse; usual access to physician, GP or clinic; no additional case management or education	http://www.liebertonline.com/doi/abs/10.1089/tmj.2007.0037

TABLE 3 DIABETES

REFERENCE OF STUDY	STUDY TYPE	PATIENTS POPULATION	STUDY DURATION	STUDY OUTCOME	TYPE OF INTERVENTION	LINK
Chumbler et al. (2009): Mortality risk for diabetes patients in a care coordination, home-telehealth programme. Journal of Telemedicine and Telecare, 15(2), 98–101	Retrospectively matched controlled comparison using propensity scores	<ul style="list-style-type: none"> • 774 patients (387 for each group) • Mean age 68 yr 	4 years	<ul style="list-style-type: none"> • Reduction of 4-year all-cause mortality: hazard ratio 0.69, 95% CI 0.50–0.92, p=0.013 • Mean survival time: intervention 1348 days versus control 1278 days, p=0.015 • Slightly higher comorbidity score and pre-enrollment outpatient visits in intervention group 	Veterans Health Administration (VHA) care coordination/ home-telehealth (CC/HT) program using Health Buddy as communication device for education and monitoring of symptoms and health status; Care coordinators (registered nurses and nurse practitioners) monitored the answers from the devices daily so that early interventions could be made	http://jtt.rsmjournals.com/cgi/content/abstract/15/2/98
Chumbler et al. (2005): Evaluation of a care coordination/home-telehealth program for veterans with diabetes: health services utilization and health-related quality of life. Eval Health Prof, 28(4), 464-78.	<ul style="list-style-type: none"> • Uncontrolled, pre-post evaluation • Setting: VA sites in the Florida, Southern Georgia, and Portsmouth region (USA) 	445 patients, 2 or more hospitalizations or ED visits in the 12 months preceding enrollment,	12 months	<ul style="list-style-type: none"> • Hospitalizations: -50% • ER visits: -11% • BDOC: -3days, improvement of HrQoL 	Veterans Health Administration (VHA) care coordination/ home-telehealth (CC/HT) program using Health Buddy as communication device for education and monitoring of symptoms and health status	http://ehp.sagepub.com/cgi/content/abstract/28/4/464