**Schumacher PM et al. The evidence for pharmacist care in outpatients with heart failure: a systematic review and meta-analysis.** *ESC Heart Failure*

## <span style="color:red">Table S1</span> Summary characteristics of the 24 included RCTs

| First Author | Year | Country | Number of HF patients | Obser-vation period | Type of patients (recruitment site) | Site of inter-vention | Type of intervention (IV) | Persons performing intervention | Outcomes/Objectives (P=primary, S=secondary, CG= control group, IG= intervention group) | Intervention effect |
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| Azad N[1] | 2008 | Canada | 91 | 6 weeks + 6 months | Outpatients: Referred from hospital or community to outpatient clinic | Outpatient clinic | 1) Optimize medical care; 2) Exercise program with educational counselling and dietary management.<br><br>12 visits over 6 weeks. | physician, nurse, dietitian, physio-therapist, social worker, pharmacist | P: Changes in scores of MLHFQ (QoL). S: Changes in scores of - SF-36 (QoL) - Mini-Mental (MMSE) - 15-item Geriatric Depression Scale (GDS) - Physical self-maintenance Scale PSMS); Survival and health service utilization over 6 months | P: No sign. difference in MLHFQ-scores (IG vs. CG;p=0.470). S: SF-36: n.a.; MMSE: No sign. difference; GDS: No sign. difference; PSMS: No sign. difference (IG vs. CG; p=0.321); No sign. difference in survival (IG vs. CG; p=0.218); Sign. increase in mean no. of cardiologist visits in IG (IG vs. CG; p<0.001); Sign. increase in mean no. of family MD visits in IG (IG vs. CG; p=0.018); Significant increase in mean no. of HF hospitalizations in IG (IG vs. CG; p=0.019); No sign. difference in mean no. of all-cause hospitalizations (IG vs CG; p=0.16). |
| Barker A[2] | 2012 | AUS | 120 | 6 months | Inpatients: hospital | Patient home | 1) Post-discharge home medication review to check if medication is used as prescribed and followed evidence-based guidelines; 2) Education provided about incorporating medication in daily routines; 3) Check if appointments at local physicians were kept; 4) Identification of expired medication; 5) Information of community pharmacist on medication regimen of participant.<br><br>3 appointments: 96 h, at 1, and at 6 months post-discharge. | Study pharmacist | P: Number of deaths; All-cause readmission rate; Inpatient days of all-cause hospitalizations; HF hospitalizations. S: QoL: Changes in scores of - SF-36 - AQoL at 1 and 6 months after enrollment. | P: No sign. difference in number of deaths (IG vs. CG; HR=1.41, 95% CI 0.5-3.97; p=0.514); No sign. difference in all-cause readnission rate (IG vs. CG; IRR=1.18, 95% CI 0.78-1.79; p=0.417); Significant increase in Inpatient days of all-cause hospitalization in IG (IG vs. CG; IRR=1.25, 95% CI1.06-1.48; p=0.009); Significant increase in inpatient days of HF hospitalization in IG (IG vs. CG; IRR=2.34, 95% CI 1.8-3.05; p=0.000). S: SF-36: Significant improvements in physical functioning (at 1 and 6 months) and mental health (at 6 months) in IG; AQoL: no sign. difference at 1 or 6 months. |

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| Bloodworth LS[3] | 2019 | USA | 96 | 180 days | Inpatients: hospital | Patient home, Telephone appoint-ments | Post discharge telephone intervention on days 2, 9, 25:<br>1) comprehensive medication review, assessing health status, identifying and solving potential or existing drug related problems (DRP) on indication, effectiveness, safety and adherence;<br>2) answering patient questions;<br>3) assessing and reinforcing adherence;<br>4) providing information on discharge instructions;<br>5) addressing disease specific standard of care protocols;<br>6) ensuring patient has a primary care provider.<br><br>Face-to-face intervention on days 4-7 and 90 and final telephone intervention on day 180:<br>1) development of an action plan for adherence to medication and lifestyle changes;<br>2) providing disease-specific health education;<br>3) solving DRP. | Community pharmacist; face-to-face visits also performed by pharmacist transitions coordinator or pharmacy residents | P: 30-day-readmission rate (index diagnosis); 30-day-readmission rate (all-cause).<br>S: Mean time to readmission for index diagnosis;<br>Mean time to readmission for index diagnosis;<br>Number of MTM encounters (IG);<br>Number of DRP (IG);<br>Number of clinical interventions (IG). | P: No sign. difference in 30-day-readmission rate (index diagnosis) (IG 5.8% vs. CG 6.9%; p=0.761);<br>No sign. difference in 30-day-readmission rate (all-cause) (IG 10.5% vs. CG 16.2%; p=0.242).<br>S: No sign. difference in mean time to readmission (index diagnosis) (IG 82.8 days (43.5-122.0) vs. CG 68.5 days (46.1-90.9); p=0.539);<br>Sign difference in mean time to readmission (all cause): (IG 94.4 days (76.9-112.0) vs. CG 68.1 days (54.981.3); p= 0.002).<br><br>Number of MTM encounters: 59.4% of enrolled patients completed at least 1 MTM encounter, of those 20.8% 2 encounters, 16.7% 3 encounters;<br>Number of DRP: 98.1% of patients had at least one DRP, 20% > 5 DRP, e.g. 54.4% required additional drug therapy;<br>Number of clinical interventions:453 interventions, chronic disease education in 31.1% as most common type. |
| Bouvy ML[4] | 2003 | Nether-lands | 152 | 6 months | Inpatients: hospital; outpatients: specialist outpatient HF clinic | Com-munity pharmacy | 1) Structured patient interview at first pharmacy visit after inclusion;<br>2) Discussion of drug and reasons for non-adherence use based on computerized medication history;<br>3) Reinforcing medication adherence.<br><br>Monthly patient contact. | Community pharmacists | P: Number of days without loop diuretic;<br>Periods with ≥ 2 days of consecutive non-dosing (MEMS).<br>S: Number of all-cause readmission;<br>Number of deaths;<br>QoL: Changes in scores of MLHFQ, COOP-WONCA. | P: Sign. difference in number of days without loop diuretics (IG 140/7656 days vs. CG 337/6196 days; RR 0.33, 95% CI, 0.24-0.38);<br>Sign. difference in periods with ≥ 2 days of consecutive non-dosing (IG 18/7656 days vs. CG 46/6196 days; RR 0.82, 95% CI 0.19-0.55).<br>S: No sign. differences in number of all-cause readmission, number of deaths or QoL. |
| Bucci C[5] | 2003 | Canada | 80 | IG: mean 42.4 (30-90) days CG: mean 44.7 (30-83) days | Outpatient clinic | Outpatient clinic | "Patients randomized to the IG received the outlined pharmacist services, that is, functioning as part of the healthcare team, meeting the patients' drug-related needs and insuring continuity of care" | Pharmacist as team member in the heart function clinic | P: Mean changes in MAI-scores.<br>S: Mean changes in directive guidance scale (DG). | P: No sign. difference in mean changes in MAI-scores (IG 0.74 ± 2.42 vs. CG 0.49 ± 1.82; p=0.605).<br>S: Sign. difference in mean changes in total DG score (IG 9.97 vs. CG 1.00; p<0.001). |

| Author | Year | Country | N | Duration | Setting | Intervention location | Intervention | Provider | Outcomes | Results |
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| Chambela MDC[6] | 2019 | Brazil | 81 | 1 year | Outpatients: clinic office, appointment with the clinical pharmacist after doctor's appointment. | Pharma-cist office in clinic | 1) Dispensing of drugs; 2) Pharmacist consultation; 3) Organization of drugs into a scheme based on coloured labels to support understanding of the prescription; 4) Explanation of the drug scheme and reinforcing patients to understand the instructions for intake; 5) Reinforcement of adherence to the treatment (explanation of each drug, dosage and importance of correctly following the prescription), to recognize and solve problems; 6) Improving patients knowledge and understanding of HF; 7) Solving DRP with the cardiologist. | Clinical pharmacist | P: QoL: Changes in scores of - SF-36 - MLHFQ. S: Changes in mean number of DRP; Mean changes in medication adherence (Morisky scale). | P: SF-36: sign. difference in scores at 12 months (IG vs. CG) for - physical functioning 16.6 vs. -8.5 (p<0.001) - role-physical 34.0 vs. 5.2 (p=0.01) - general health 19.4 vs. -6.1  (p<0.001) - vitality 11.5 vs. -5.8 (p=0.003) -social functioning 7.5 vs. -13.3 (p=0.002) - mental health 9.0 vs. -3.7 (p=0.006); MLHFQ: sign. difference in scores (IG  -12.7 vs. CG 4.8; p<0.001). S: Sign. decrease of DRP at 6 months (IG -0.6 vs. CG 0.0; p=0.005); Sign. increase of medication adherence at 3 months (IG -0.7 vs. CG 0.1; p=0.001). |
| Gattis WA[7] | 1999 | USA | 181 | 6 months | Outpatients | Outpatient clinic, Telephone appoint-ment | 1) Discussing patient's case with the attending physician; 2) Providing therapeutic recommendations for therapy optimization: focus on HF medication (ACEi use and target doses, DRP etc.); 3) Discussing changes in drug therapy with the patient and explanation of prescribed drugs; 4) Reinforcing medication adherence; 5) Provision of a medication plan. Follow-up via telephone (at 2, 14, 24 weeks) to identify DRP and clinical events, to discuss with physician, if necessary. | Clinical pharmacist | P: Composite number of all-cause mortality and HF readmissions. S: Median of prescribed ACEi doses. | P: Sign. difference in composite all-cause mortality and HF readmissions (IG 4 vs. CG 16, OR 0.22, 95% CI 0.07-0.65; p=0.005). S: Sign. difference in median (Q25/Q75) ACEi doses at 6 months (IG 1.0 (0.5/1) vs. CG 0.5 (0.188/1); p<0.001); No sign. difference in overall ACEi prescription between IG and CG. |

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| Goodyer LI[8] | 1995 | UK | 100 | 3 months | Outpatient clinics | Patient home | 1) Standardized medication counselling on prescribed drugs (verbally and written information leaflets); 2) Providing medication plan. Three home visits, in a 2-4 weeks' interval. | Pharmacist | Changes between and within IG and CG in - Medication adherence (tablet count per intended number of tablets) - Knowledge of drugs - 6-minutes walk test - Bodyweight/oedema - Subjective symptom scores (Nottingham Health Profile (NHP), Visual Analogue Scale (VAS)). | Sign. difference in medication adherence (IG 93% ± 11.7 vs. CG 51% ± 31.5;, p<0.001); Sign. improvement in knowledge of drugs on awareness of name, purpose, dose and adverse effects (IG vs. CG;p<0.001); Sign. difference in 6-minutes-walk test (IG 159 m (190-128) vs CG 123 m (142-100); p<0.001); No sign. difference in bodyweight (IG vs. CG); Sign. difference for percentage patients with no peripheral oedema (IG 81 % vs. CG 49%; p<0.05); NHP: no sign. difference between scores (IG vs. CG); VAS: significant difference in median (Q25/Q75) scores (IG vs. CG). |
| Heaton PC[9] | 2019 | USA | 113 | 30 days | Patients at hospital discharge: Hospital | Com- munity pharmacy | 1) Medication reconciliation/ medication review; 2) patient counselling incl. education on new medication or diagnoses; 3) Self-management education, setting health-related goals; 4) Education on symptoms for disease deterioration and according actions; 5) Primary adherence: ensuring fill of first prescription; secondary adherence: provision of medication in pill boxes; 6) Providing folder with necessary information on medication (incl. medication plan) and appointments) 7) Providing logs for self-monitoring (weight, blood pressure etc.). | Community pharmacists | P: 30-day readmission rate. S: Medication adherence (primary non-adherence for 30 days after discharge (picked up prescriptions per filled prescriptions); Secondary adherence for 180 days after discharge (PDC >80%)); Patient satisfaction; Mean number and types of pharmacist IV. | P: No sign. difference in 30-day readmission rate for ITT (IG 11.3% vs. CG 10.7%; p=0.49); Sign. difference in 30-day readmission rate for PP(IG 1.6% vs. CG 10.7%; p=0.02. S: No sign. difference in primary non-adherence ITT (IG 8.3% ± 20.8 vs. CG 8.9 ± 21.8; p=0.87); No sign. difference in primary non-adherence PP (IG 6.4% ± 18.6 vs. CG 8.9 ± 21.8; p=0.59); Sign. difference in secondary adherence ITT (IG 60.5% vs. CG 37.5%; p=0.04); No sign. difference in secondary adherence PP (IG 60.5% vs. CG 37.5%; p=0.09); No sign. difference in patient satisfaction (IG vs. CG); Mean number of pharmacist IV per patient IG: 6.2 (0-21); mostly self-care and self-monitoring recommendations. |

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| Hogg W[10] | 2009 | Canada | 41 | 14.9 months (Mean) | Outpatients: family health network (primary care) | Patient home, Telephone appoint-ments | 1) Medication review (incl. identifying DRP and adressing potential DRP in multidisciplinary team (pharmacist IV). | Pharmacist, NP, family physician | P: Changes in Quality of care for chronic disease management (CDM-score). S: Changes in blood pressure; Adherence to preventive care recommendations; Changes in QoL (SF-36, health related QoL); Changes in hospitalizations and emergency use. | P: Sign. improvement of CDM-score in IG (IG vs. CG absolute difference 9.1%; 95% CI 3.7-14.4%; p=0.013). S: No sign. difference in blood pressure; Sign. difference in overall adherence for preventive care recommendations (IG vs. CG absolute difference 18.1%, 95% CI 10.8-25.5%; p<0.001); No sign. difference in QoL-scores; No sign. differences in hospitalizations or emergency use. |
| Holland R[11] | 2007 | UK | 293 | 6 months | Patients at hospital discharge: Hospital | Patient home | 1) Medication review; 2) Providing advice on - symptom self-management - lifestyle advice. 1-2 visits within 2 and 8 weeks after discharge. | Community pharmacists | P: Number of all-cause emergency readmissions. S: Number of deaths; Changes in QoL (mean difference MLHFQ, EQ-5D); Changes in medication adherence (MARS-score). | P: No sign. difference in all-cause readmissions (IG 134 admissions vs. CG 112, rate ratio 1.15, 95% CI 0.89-1.48; p=0.28). S: No sign. difference in number of deaths (IG 30 vs. CG 24 , HR 1.18, 95% CI 0.69-2.03; p=0.54); No sign. difference in QoL-scores (adjusted mean difference IG vs. CG, MLHFQ:3.73, 95% CI -3.67-11.13; p=0.32; EQ-5D: 0.07, 95% CI -0.01-0.14; p=0.008); No sign. difference in adherence (adjusted mean difference IG vs. CG 0.12, 95% CI -0.48-0.73; p=0.68). |
| Korajkic A[12] | 2011 | AUS | 70 | 3 months | Outpatient clinic | Outpatient clinic | 1) Patient education focusing on - self-adjusting diuretic dosing (furosemide) - improving self-care - recognizing symptoms of fluid retention - daily weight measure - improving knowledge on HF and HF drugs; 2) Provision of weight/dosing logs. 30 min educational session during clinic appointment, followed by monitoring calls at 4, 8 and 12 months. | Pharmacist | P: Mean number of appropriate weight-titrated furosemide dose adjustments per patient. S: Number of patients who appropriately self-adjusted the loop diuretic dose; Number of appropriate dose-adjustments; Number of HF readmissions; Changes in QoL-scores (MLHFQ); Number of patients with improved knowledge of HF and drugs. | P: Sign. improvement in mean number of appropriate weight-titrated furosemide dose adjustments (IG vs. CG, 2nd month p=0.02, 3rd month p=0.005). S: Sign. difference in number of patients who appropriately self-adjusted the loop diuretic dose after 3 months (IG 28 vs. CG 18; p=0.01); Sign. difference in number of appropriate adjustments (IG vs. CG, 2nd month p=0.01, 3rd month p=0.004); Sign. difference in number of HF readmission (IG 14% vs. CG 31%; p=0.04); Sign. difference in total MLHFQ-score (IG 48 ± 19, CG 38 ± 21; p=0.03); Sign. difference in HF knowledge(IG 94% vs. CG 71%; p=0.01). |

| Author | Year | Country | N | Follow-up | Setting | Intervention provider/location | Intervention | Provider | Primary (P) / Secondary (S) outcomes | Results |
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| Lee KK[13] | 2020 | USA | 2091 | 30 days | Patients at hospital discharge: Hospital | Telephone appoint-ment | 1) Giving directions on diuretic-titration and on other HF drugs; 2) Assessing reported HF symptoms, weight and vital signs to order laboratory tests; 3) Aranging necessary follow-up appointments with physicians; 4) Scheduling further telephone appointments, if clinically necessary. | Study pharmacist, study nurse | P: 30-day-readmission for HF after discharge. S: 30-day-readmission for any cause, 30-day all-cause death; Succesful completion of early follow-up; Utilization of telephone appointment or 7-day clinic appointment. | P: No sign. difference of 30-day-readmission for HF (IG: 8.6% vs. CG 10.6%; p=0.11). S: No sign difference of 30-day-readmission for any cause (IG: 18.8% vs. CG: 20.6%; p=0.30); No sign. difference of 30-day all-cause death (IG: 4.0% vs. CG: 4.6%; p=0.49); Sign. difference in completed early follow-up (IG: 92% vs. CG: 79%;p<0.001); Sign. difference in frequency of clinical visits during 7 days after discharge (IG 48% vs.CG: 77%; p<0.001). |
| Linné AB[14] | 1999 | Sweden | 130 | 6 months | Outpatients 1 week after hospital discharge | Study site hospital | 1) Patient education on - HF medication, effects and side effects - information on (side) effects of prescribed HF medication; 2) Interactive CD-portfolio program (with portable photo CD-player + mini-TV) on - symptoms, signs and causes of impairment - action and side-effects of HF medication.  3 weeks post discharge (pharmacist IV). | Study pharmacist, study nurse | P: Mean difference in scores of a questionnaire on general knowledge and treatment of HF. S: Number and type of visits to the healthcare system; Changes in medication. | P: Sign. difference in knowledge scores (IG 17.2 points (95% CI 15.9-18.5) vs. CG 14.3 points (95% CI 13.0-15.6); p=0.0051). S: reported "elsewhere" (PMID: 10938491). |
| López Cabezas C[15] | 2006 | Spain | 134 | 12 months | Patients at hospital discharge: Hospital | Inpatient ward of study site hospital, Telephone appoint-ments | 1) Patient education on the disease, drug therapy and diet.  Regular telephone appointments: monthly during the first 6 months, then bi-monthly for reinforcement (e.g. education). | Hospital pharmacist | P: Time to first all-cause readmission; Percentage of patients with all-cause readmissions; Number of readmissions per patient; Number of hospital stay days per patient. S: Medication adherence; QoL (EuroQol); patient satisfaction with care; Number of deaths. | P: Time to first readmission: n.a.; Sign. difference in percentage of patients with all-cause readmissions at 6 months (IG 42.2% vs. CG 24.3%; p=0.028, n.s. at 12 months); Sign. difference in number of readmissions per patient at 6 months (IG 0.36 ± 0.72 vs. CG 0.84 ± 1.45; p=0.023; n.s. at 12 months); Sign. difference in number of hospital stay days per patient at 6 months (IG 4.3 ± 13.1 vs. 6.8 ± 12.5;p=0.020; n.s. at 12 months). S: No difference in medication adherence at 12 months (IG 85.0% vs. CG 73.9%;p=n.a.); No sign. difference in QoL at 2, 6 and 12 months (n.s.); Sign. difference at satisfaction with care at 2 months, (p=0.026; n.s. at 6 and 12 months); Sign. difference in deaths at 12 months (IG 12.9% vs. CG 29.7% (IG); p<0.05). |

| Author | Year | Country | N | Follow-up | Setting | Location | Intervention | Provider | Outcomes | Results |
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| Lowrie R[16] | 2012 | UK | 2164 | 4.7 years (median) | Outpatients: primary-care family doctor practices | Primary care practices | 1) Medication review to optimize medical treatment according to guidelines. | Primary care pharmacists, family doctors | P: Composite all-cause death or HF readmission. S: Composite of all-cause death or CV readmission; All-cause death; all-cause readmissions; Total number of readmissions. | P: No sign. difference in composite all-cause death or HF readmission (IG 36% vs. CG 35%, adjusted HR 0.97; 95%CI, 0.83-1.14; p=0.72). S: No sign. difference in composite of all-cause death or CV readmission (IG 45% vs. CG 44%, adjusted HR 0.97; 95%CI, 0.84-1.12; p=0.70); No sign. difference in all-cause death (IG 31% vs. CG 31%, adjusted HR 0.96; 95%CI, 0.80-1.16; p=0.68); No sign. difference in all-cause readmission (IG 65% vs. CG 65%, adjusted HR 0.97; 95%CI, 0.87-1.09; p=0.61); No sign. difference in total number of readmissions (IG 2205 vs. CG 2191; p=0.84). |
| McCarren M[17] | 2013 | USA | 220 | 12 months | Outpatients: identified via Veterans electronic administrative databases | Community pharmacy | 1) Information to pharmacist on VHA facility guidelines on beta-blocker prescribing (Level 1, IG and CG); 2) Provision of a list with patients not meeting guideline goals (Level 2; IG). | Community pharmacists supported by study coordinators | Change in prescription concordance at 6 months; Number of patients reaching target dose. | Sign. difference in full concordance with guideline goals (IG 5% vs. CG 4%, OR 1.9, 95%CI 1.1-3.2; p=0.024); No sign. difference in number of patients reaching <50%, 50%, >50% of target dose (IG 43, 44, 13% vs CG 69, 25, 6%; OR 1.6, 95%CI 0.8-3.2). |
| Murray MD[18] | 2007 | USA | 314 | 12 months | Inpatients: at hospital discharge; Outpatients: general medicine practices; cardiology practice | Study pharmacy close to ambulatory care centre | 1) Dispensing specially labeled medication; 2) Assessing patients' knowledge; 3) Providing instructions about medication use; 4) Providing patient-centred verbal instructions and written materials about the medication to support the use of prescribed drugs; 5) Monitoring of medication use, health care encounters, bodyweight etc. via study database. | Pharmacist in study pharmacy | P: Medication adherence (MEMS); Refill adherence (MPR); Combined HF/CV/all-cause readmissions and emergency visits. S: QoL (Chronic HF Questionnaire); Satisfaction with pharmacy service (internal validated questionnaire); Annual direct costs. | P: Sign. difference in medication adherence (IG 78.8% vs. CG 67.9%, difference, 10.9 percentage points; 95% CI, 5.0-16.7); Sign. difference in refill adherence (IG 109.4% vs. CG 105.2%, difference 4.2 percentage points; p=0.007); Sign. difference in combined all-cause readmissions and emergency visits (IG vs. CG 19.4% less in IG, IRR, 0.82, 95% CI, 0.70-0.93); No sign. difference for combined readmissions and emergency visits for HF/CV (IG vs. CG, n.s.). S: No sign. difference in disease-specific QoL (IG vs. GC; at 6 months: p=0.52; at 12 months: p=0.21); Sign. difference in patient satisfaction (IG 1.0 vs. 0.7; p=0.022); Sign. No sign. difference in annual direct costs (IG vs. CG, difference US$-2960, 95% CI, US$-7603-US$1338). |

| Author | Year | Country | N | Duration | Setting | Location | Intervention | Provider | Outcomes | Results |
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| Sadik A[19] | 2005 | United Arab Emirates | 221 | 12 months | Inpatients: general medical ward Outpatients: cardiology and medical outpatient clinics | Inpatient ward or outpatient clinic | 1) Discussing drug therapy with the physician if rationalization or simplification of dosage regimens were deemed appropriate (Medication review); 2) Providing patient education - on HF, prescribed medication and management of HF symptoms (verbal) - Booklet (information on HF, HF symptoms, treatment aims, adherence, side effects, diet and lifestyle changes - on self-monitoring (signs and symptoms, adherence), using monitoring diary card (daily weight), instructions on titrating diuretics if weight increases and to contact the physician immediately - instructions on daily exercise (walking). | Research pharmacists | 2-min walk distance (AUC); blood pressure/pulse; bodyweight; FVC (AUC); QoL (MLHFQ, SF-36; both AUC); Medication knowledge; Self-reported adherence. | Sign. difference in 2-min walk distance (IG 1607.2,95% CI 1474.9-1739.5 m.month vs. CG 1403.3, 95% CI 1256.5-1549.8; p=0.043); Sign. difference in blood pressure/pulse (IG vs. CG; p<0.05); Bodyweight: n.a.; Sign. difference in FVC (IG 31.6, 95% CI, 30.8-32.4 l.month vs. CG 27.8, 95% CI, 26.8-28.9; p<0.05); Sign. difference in MLHFQ-scores (IG 463.5, 95% CI, 433.2-493.9 unit.month vs. CG 637.5, 95% CI, 597.2-677.7; p<0.05; Sign. difference in SF-36 for all domains (IG vs. CG; p<0.05) except general health and physical functioning; Sign. difference in medication knowledge (IG vs. CG; p<0.05); Sign. difference in self-reported adherence (IG 85 vs. CG 35; p < 0.05). |
| Schulz M[20] | 2019 | Germany | 237 | 2 years (median) | Outpatients: GP office; internal medicine specialists; office and hospital-based cardiologists | Community pharmacy | 1) Medication review to generate a consolidated medication plan with the patient's physician; 2) Providing medication in weekly dosing aids; 3) Update of medication plan; 4) Patient counselling on HF medication; 5) Measurement of blood pressure and pulse rate; 6) Continous management of new DRP. (Bi-)weekly visits to pharmacy. | Community pharmacists and recruiting physician | Efficacy: P: Difference in adherence (PDC) during 365 days. S: Proportion of adherent patients (PDC ≥ 80%); QoL (MLHFQ). Safety: P: Days lost due to unplanned cardiovascular hospitalization or death. | Efficacy: P: Sign. difference in adherence (IG vs. CG, difference +5.7%,95 CI 1.6-9.8;, p=0.007). S: Significant difference in proportion of adherent patients (IG vs. CG, ∆18%, OR 2.9, 95% CI 1.4-5.9; p=0.005); No sign. difference in QoL at one year (IG vs. CG, n.s.); Significant difference in QoL at two years (IG vs. CG, -7.8 percenage points, 95% CI -14.5 to -1.1; p=0.02). Safety: No sign. difference in all outcomes (IG vs. CG, n.s.). |

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| Stewart S[21] | 1998 | AUS | 97 | 6 months | Patients at hospital discharge: Hospital | Patient home | 1) Providing medical counselling; 2) Initiating a daily reminder routine; 3) Providing weekly dosing aids; 4) Providing medication information and reminder card; 5) Referral to a community pharmacist. | Study pharmacist, study nurse | P: Mean frequency of composite unplanned readmissions and out-of-hospital deaths. S: Time to first primary endpoint; Rate of unplanned readmissions; Total days of hospitalization; All-cause deaths; Emergency visits; Costs of hospital-based health care. | P: Sign. difference in mean frequency of composite unplanned readmission and out-of-hospital deaths (IG 0.8 ± 0.9 vs. CG 1.4 ± 1.8; p=0.03). S: No sign. difference in time to first primary event (IG vs. CG, n.s.); Sign. difference in rate of unplanned readmissions (IG 36 vs. CG 63; p= 0.03); Sign. difference in days of hospitalization (IG 261 vs. CG 452; p=0.05); No sign. difference in all-cause deaths (IG 6 vs. CG 12; p=0.11); Sign. difference in emergency visits (IG 48 vs. CG 87; p=0.05); No sign. difference in costs (IG vs. CG, n.s.). |
| Triller DM[22] | 2007 | USA | 154 | 6 months | Patients at hospital discharge: Hospital | Patient home | At initial assessment: 1) Medication review with patient interview on use (identifying DRP and inappropriate use); 2) Counselling patients on lifestyle changes (diet, smoking) 3) Promoting medication adherence.<br><br>2 follow-up visits (7-10; 18-21 days after initial assessment)<br><br>During intervention period (first 3 weeks): 4) Review of physician notes and laboratory test values via database; 5) Interaction with prescriber if necessary (recommendations based on interview and monitoring of data). | Study pharmacist | All-cause hospitalization; HF-related hospitalization; All-cause deaths; Time to primary outcome event; Total events (composite all-cause hospitalization and deaths); Total hospital days; QoL. | No sign. difference in all-cause hospitalizations (IG vs. CG, Relative Risk (RR) 0.93; p=0.63); No sign. difference in HF related hospitalization IG vs. CG, RR 0.82; p=0.26); No sign. difference in all-cause deaths (IG.vs. CG, RR 1.21; p=0.67); Time to primary event: n.a.; No sign. difference in composite endpoint (IG vs. CG, RR 0.98; p=1.0); No sign. difference in hospital days and QoL (IG vs. CG, n.s.). |

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| Tsuyuki RT[23] | 2004 | Canada | 766 | 6 months | Patients at hospital discharge: Hospital | Inpatient ward of study site hospital, Telephone appoint-ments (patient home) | Stage 1: Advise on prescribing ACEi or check of ACEi dosage (all patients IG/CG); Stage 2: 1) Patient education program (written material); 2) Providing of adherence aids (dosing aid, medication plan, daily weight log); 3) Providing monthly newsletter "Living with Congestive HF" (IG). <br><br>Telephone appointments at 2 weeks, 4 weeks, therafter weekly for 6 months after discharge for reinforcement (e.g. adherence, education). | Research (hospital) pharmacists and research nurses | Stage 1: P: Proportion of patients receiving ACEi at hospital admission compared with that at hospital discharge. S: Dosage of ACEi at hospital admission compared with that at hospital discharge. Stage 2: P: ACEi adherence (MPR for 180 days). S: Clinical events. | Stage 1: P: Sign. difference in ACEi at admission:58% vs. 83% at discharge; p<0.001. S: Sign. difference in average daily ACEi dose at hospital admission/initiation 11.3 ±-8.8 mg/day enalapril equivalents vs. discharge: 14.5 ± 8.8 mg/day; p<0.001. Stage 2: P: No sign. difference in ACEi adherence (IG 83.5 ± 29% vs. CG 86.2 ± 29%; p=0.691). S: No sign. difference in all cause clinical events (IG vs. CG, n.s.); Sign. difference in total length of hospital stay (IG 627 days vs. CG 1082 days;p<0.001); Sign. difference in average length of hospital stay(IG 6.6 ± 5.5 days vs CG 11.0 ± 9.2 days; p<0.001). |
| Varma S[24] | 1999 | UK | 83 | 12 months | Inpatients: hospital Outpatients: outpatient clinic | Inpatient ward or outpatient clinic of study site hospitals | 1) Discussing drug therapy with the physician if rationalization or simplification of dosage regimens were deemed appropriate (Medication review); 2) Providing patient education - on HF, prescribed medication and management of HF symptoms (verbal) - Booklet (information on HF, HF symptoms, treatment aims, adherence, side effects, diet and lifestyle changes - on self-monitoring (signs and symptoms, adherence), using monitoring diary card (daily weight), instructions on titrating diuretics if weight increases and to contact the physician immediately - instructions on daily exercise (walking). | Research pharmacists | 2-minute walk test; Blood pressure/pulse; Body weight/BMI; FVC; QoL (MLHFQ, SF-36); Adherence (self-report, Drug use profiles); Knowledge on medication; Number of hospital admissions; Number of emergency room visits/ call-outs. <br><br>At 3, 6 and 12 months. | Sign. difference in 2-minute walk test at 6 months (IG 90.3 ± 39.2 m vs. CG 64.2 ± 29.4 m; p=0.003); Sign. difference in diastolic blood pressure at 12 months (IG 70.7 ± 10.4 mmHg vs. CG 59.4 ± 8.3; p=0.001); No sign difference in body weight, BMI, FVC (IG vs. CG, n.s.); Sign. difference in scores of MLHFQ at 9 months (IG 15.6 ± 14.6 vs. CG 25.7 ± 18.5; p=0.004); Sign. differences in some domains of SF-36 (IG vs. CG; p<0.05); Sign. difference in adherent patients according to drug use profiles (IG 10 vs. CG 3; p= 0.039); Sign. difference in patient knowledge on HF drugs at 12 months (IG vs. CG; p=0.0026); Sign. difference in hospital admissions (IG 14 vs. CG 27; p=0.006); No sign. difference in ER use (IG vs.CG, n.s.) |

ACEi, angiotensin-converting enzyme inhibitor; AUS, Australia; BMI, body mass index; CG, control group; CI, confidence interval; COOP-WONCA (generic quality of life instrument); CV, cardiovacular; DRP, Drug Related Problem; GDS, Geriatric Depression Scale; GP, general practitioner; FVC, forced vital capacity; HF, heart failure; HR, hazard ratio; IG, intervention group; IRR, incidence rate ratio; ITT, intention-to-treat; IV, intervention; MAI, medication appropriateness index; MD, medical doctor; MLHFQ, Minnesota Living with Heart Failure Questionnaire (HF-specific QoL instrument); MEMS, medication event monitoring system; MPR, medication possession ratio; MTM, medication therapy management; n.a., not available; NP, nurse practitioner; n.s., not significant; OR, odds ratio; QoL, quality of life; PDC, proportion of days covered; PP, per protocol; SF-36, short form 36 (generic quality of life instrument);sign., significant; UK, United Kingdom; USA, United States of America; VHA, veterans health administration.

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