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Post-Hospitalization Transition Phase after an Episode of Acute Congestive Heart Failure Program (p.e.a.c.h. Program). Adoption of a Remote Medicine System in the Post-Hospitalization Transition Phase after an Episode of Acute Congestive Heart Failure (tele p.e.a.c.h.) Creation of an Organizational Model based on Telemedicine with Contextual Collection of Clinical, Laboratory, Ultrasound Parameters and their Correlation with Short-Medium Term Outcomes (Data p.e.a.c.h)

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Abstract

The transition phase after hospital discharge for acute heart failure must be governed to achieve the best guideline-directed medical therapy (GDMT) and to avoid major outcomes. For this reason, we planned a 30-day follow up with tele visit and with bio humoral and heart-lungs ultrasound parameters. The KCCQ score, a clinical monitoring form, a HLPOCUs diagram and a database were used to titrate the drugs and to record a prognostic score. Four weeks after discharge the percentage of patients in GDMT had increased, the clinical signs of heart failure had disappeared, the echo graphic parameters of systolic/diastolic function and pulmonary congestion were significantly improved, the blood tests did better. The quality of life was also significantly improved as evidenced by the KCCQ score. Furthermore, the number of Emergency Department visits and hospitalizations for heart failure in the short follow up were reduced. In conclusion, post-hospitalization during the transition phase and with the help of tele nursing made it possible to optimize heart failure therapy, improve prognostic parameters and short-term outcomes.

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Introduction

Numerous scientific evidence documents the importance of an early taking of care about the patient discharged after an episode of acute heart failure [1-5]. Accurate prognostic identification, complete information-training of the patient and his caregiver, optimization of therapy according to the guidelines (GDMT) are factors that favourably modify disease outcomes such as mortality and hospital readmissions [6,7]. These objectives are pursued at heart failure clinics, that are mainly directed by multi-professional/multi-disciplinary teams [8,9]. During the recent pandemic phase, telemedicine has also come into use in heart failure clinics [10-18]. Through tele visits and teleassistance the health professional can: a) carry out a virtual post-discharge visit b) make a clinical monitoring, c) verify the compliance, d) recommend any changes in order to optimize the therapy (according to GDMT), e) administer questionnaires to evaluate quality of life (the Kansas City Cardiomyopathy Questionnaire, KCCQ) [19].

For all this reason it was decided to implement an observational study in the post hospitalization transition phase after an episode of acute congestive heart failure (P.E.A.C.H program). The patients will be followed with tele visit for the first 3 weeks and with a final visit at the 4th week after discharge (tele P.E.A.C.H). During this time interval, therapy will be optimized according to GDMT, and clinical, biochemical and instrumental data will be recorded to-build a database to identify outcomes and prognostic factors (data P.E.A.C.H.). The study began in March 2024 and is scheduled to end in December 2025. Here we report the results recorded so far.

Materials and methods

Patients

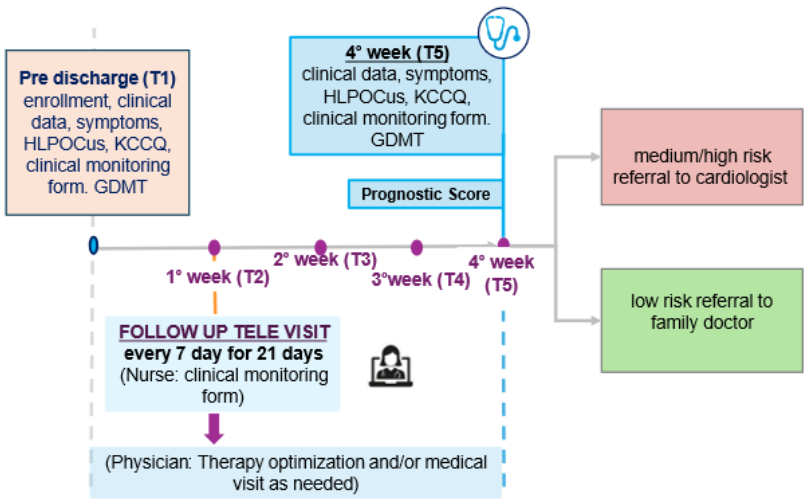
Inclusion Criteria: Hospitalization for acute heart failure episode. Diagnosis of heart failure with reduced ejection fraction (EF<40%, HFrEF). Not in optimally therapy (sec. GDMT). Age between 40 and 90 years. Signed informed consent

Exclusion Criteria: Patients who, due to clinical or laboratory conditions, cannot optimize therapy as GDMT (e.g., due to adverse drug reactions, systolic blood pressure values <100 mmHg, renal failure with eGFR <30 mL/min/1.73 m2). Patients terminally ill due to neoplastic disease and/or advanced organ disease. Advanced dementia. Patients unable to perform tele visit and/or without an effective caregiver.

Study Design and Data Collections

Pre-Discharge Visit (T1): The physician identifies the eligible patient and, upon discharge, fills out the database. Clinical data, symptoms, laboratory tests, therapies and point-of-care heart and lungs ultrasound (HLPOCUs) are recorded in the database. The nurse records the KCCQ and the clinical monitoring form.

Figure 1: Study design : P.E.A.C.H. program



PEACH: Post-hospitalization transition phase program after an Episode of Acute Congestive Heart Failure
HLPOCUs: point-of-care heart and lungs ultrasound
KCCQ: Kansas City Cardiomyopathy Questionnaire

First, Second, Third Week Tele Visit (T2, T3, T4): The nurse makes a tele visit and fills out the clinical monitoring form. The physician reviews the form and possibly adjusts the therapy, fills out the database.

Fourth Week Visit (T5): The patient is received for a check-up. On this occasion the nurse fills out the form for clinical monitoring and the KCCQ. The doctor evaluates the patient with clinical data, symptoms, laboratory tests, therapies, and HLPOCUs. Finally, he closes the discharge report-letter and fills in the database.

Instruments

Training: To carry out this project we decided to use the training tool "training improvement project".

Database: The database is built on Google Excel sheets and reports the clinical, bio humoral, pharmacological and instrumental measurements of the patients enrolled from entry (T0) to the fourth week of post-hospitalization (T5).
Nursing Clinical Monitoring form and KCCQ: Directly collected by the nurse via tele visit and with the contribution of the caregiver (T1-T5) (appendix table 1).

P.E.A.C.H. team

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Appendix table: The clinical monitoring form (telenursing)

	KCCQ (n)	Weight (kg)	PAS/ PAD (mmHg)	SatO2 (%)	Heart rate (bpm)	Orthopnea (yes/ no)	Dyspnea at rest (yes/ no)	Exertional dyspnea (yes/ no)	Edema (yes/ no)	Compliance (yes/ no)	Measures
Pre-discharge (T1)	X	x	X	X	x	x	x	x	x	X	x
1°week (T2)		x	X	X	x	x	x	x	x	X	x
2°week (T3)		x	X	X	X	x	x	x	x	X	x
3°week (T4)		x	X	X	X	x	x	x	x	X	x
4°week (T5)	x	x	X	X	X	x	x	x	x	X	x

KCCQ: Kansas City Cardiomyopathy Questionnaire; PAS: systolic arterial pressure; PAD: diastolic arterial pressure; Sat O2: oxygen saturation.

Point of Care Heart and Lungs Ultrasounds (HLPOCUs): The echography examination is planned at admission (T0), at pre-discharge (T1) and at the 4th week of post-hospitalization (T5). The parameters measured are those indicated by the guidelines for systolic-diastolic function and lungs congestion (20-23). Two doctors with proven experience and with certification from the Società Italiana di Ecocardiografia e CardioVascular Imaging (SIECVI) take turns in carrying out the exams (appendix table 2).

Table 2: Point of Care Heart and Lungs Untrasounds (HLPOCUs)

	EF%	Pattern diast.	TR velocity (m/sec)	PAPS (mmhg)	E/e'	e' (msec)	LA vol i (ml/mq)	TAPSE (mm)	VCI (mm)	Line B 8 fields (n)
Pre - dimension(T1)	x	X	x	x	x	x	x	x	x	x
4 week (T5)	x	X	x	x	x	x	x	x	x	x

EF: ejection fraction; Pattern diastolic: E/A; TR: CW doppler TR systolic jet velocity; PAPS: pulmonary artery systolic pressures; E/e': mitral E/e'; e': pulsed wave TDI e' velocity; LA: left atrium maximum volume index; TAPSE: tricuspid annular plane systolic excursion; VCI: inferior cava vein diameter; Line B: n. line B/8 zone(fields)

Blood Chemistry Tests: Among the blood chemistry tests at times T0, T1, T5 we identified those with prognostic significance, like brain natriuretic peptide (BNP), creatinine clearance (GFR), hemoglobin, transferrin saturation, carbohydrate antigen (CA 125), et al (24,25).

Endpoints

Primary Efficacy Endpoints

- Improvement of the patient's perceived quality of life, comparing the KCCQ (T1 vs T5)
- •Verification of therapeutic adherence and the possibility of optimizing heart failure therapy up to the maximum tolerated according to GDMT (T1 vs T5)
- •For each individual drug, comparison of the maximum tolerated dose with the optimal dose
- Evaluation of the effectiveness of therapeutic changes based on clinical and instrumental data recorded (T1 vs T5)
- Registration of the major outcomes at 3-6-12 months (Emergency Department (ED) admissions, hospitalizations, mortality)
- Recording of adverse events

Secondary Endpoints

- Construction of a digital clinical monitoring form and its administration to enrolled patients
- Construction of a follow-up path with the use of ultrasound focused on the heart and lungs
- Construction of a predictive re-hospitalization score

Statistical Analysis

All data entered an electronic database in anonymous form. The same data are checked to verify its consistency and completeness; therefore, the database is used for statistical analysis. Results are presented as mean ± standard deviation for continuous variables with normal distribution or as median and interquartile range (IQR) for variables with non-normal distribution. Percentages for categorical variables are used. Comparison of groups and subgroups with continuous variables is calculated using the Student's T-test or Mann-Whitney U test when appropriate, and the Chi-square test or Fischer's exact test for categorical variables. For comparison of pre- and post-discharge variables, the Paired T-test or the Wilcoxon test for paired data is used, when appropriate. All tests are

two-tailed. A $p < 0.05$ is be considered significant. Statistical analysis of the data is performed using SPSS 28 statistical software (SPSS Inc. and Microsoft Corp., Chicago, IL, USA).

Results

In March 2024 the observational study received authorization from the Ethics Committee for Clinical Trials. From then until today, 35 patients have been enrolled, of these 27 have completed the post-hospitalization follow-up (4 weeks, T5) and are the subject of our statistics.

The average age was 77 years (+ 8). Men were 59%. The average hospital stay was 9 days (+ 4). Each patient presented on average 3 chronic pathologies. In order of frequency: Hyper tensive heart disease (82%), chronic kidney disease (CKD, 52%), anemia (41%), ischemic heart disease (41%), diabetes (37%), atrial fibrillation (37%) et al. Therapy at admission (T0) consisted of: Furosemide (65%), Beta blockers (63%). Less represented were MRA (40%), ARNI (22%), ACEi (23%), and SGLT-2i (24%) (Table 1).

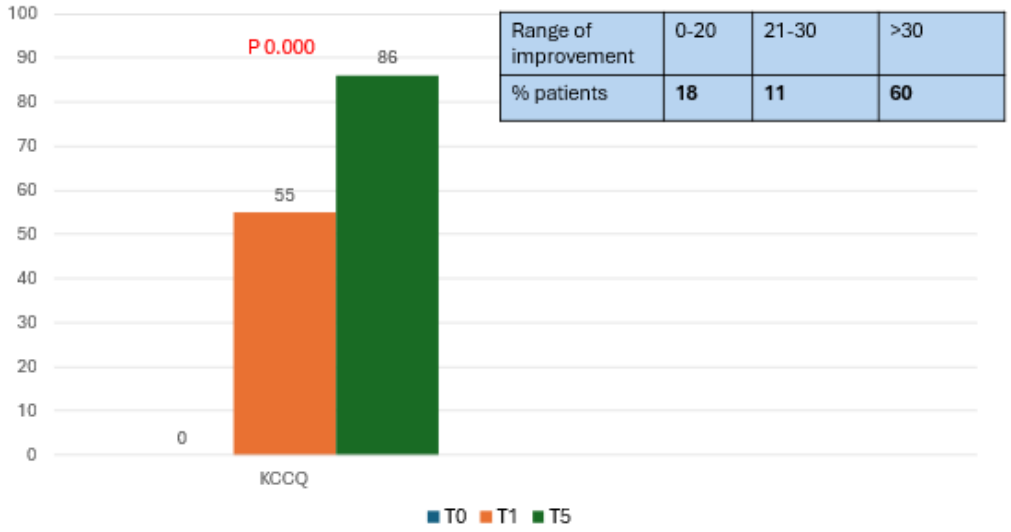
Table 1: General Data

Patients (number)	Age (Years)	Hospital Stay (days)	Men / Women (%)					
27	77	9	59/41					
Hypertensive heart diseases (%)	Ischemic heart dieases (%)	Primary dilated cardio myopathy (%)	Diabetes (%)	Atrial fibrillation (%)	Chronic obstructive pulmonary disease(%)	Kidney chronic disease (%)	Anemia (%)	
81	41	15	37	37	26	52	41	
Heart Failure admission / 12 months	0	1	2					
(%)	66	11	22					
Therapies at admission (T 0)	Sacubitril / Valsartan	ACEi	Sartani	Beta bloccanti	Ivabradina	MRA	SGLT-2i	Furosemide
(% patients)	22	23	7	63	3	40	24	65

Sacubitril/Valsartan o ARNI angiotensin receptor/neprilysin inhibitor
ACEi angiotensin-converting enzyme (ACE) inhibitors
Sartani or AT1 antagonist
MRA mineralocorticoid receptor antagonist
SGLT2i sodium-glucose cotransporter-2 inhibitors

All 27 patients completed the KCCQ format in T1 and in T5. The mean score improved significantly from T1 to T5 (55 vs 86, p =0.000) and 60% of the patients had a change of more than 30 points.

Figure 2: Improvement in Perceived Quality of Life: The KCCQ (T1 vs T5)



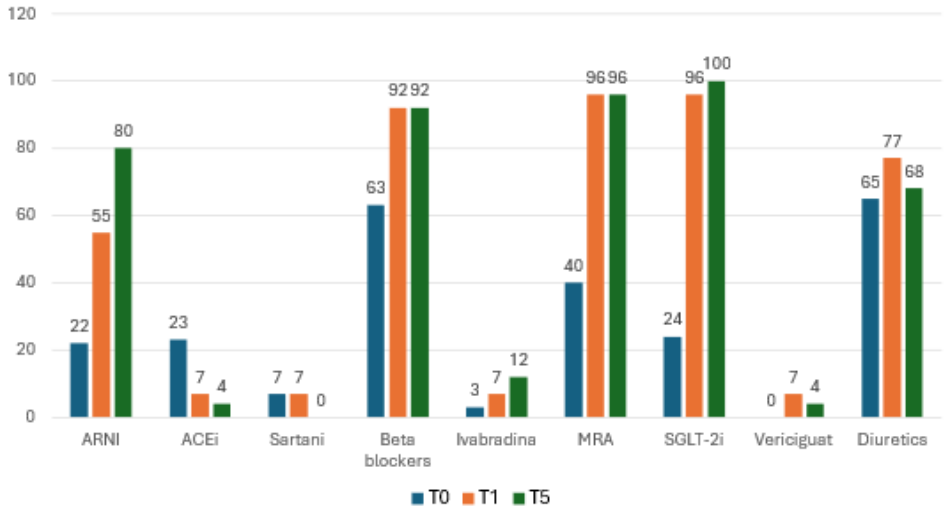
Range of improvement	0-20	21-30	>30
% patients	**18**	**11**	**60**

KCCQ: Kansas City Cardiomyopathy Questionnaire
T1 vs T5 p=0.000

The evaluation of the individual items of the KCCQ confirmed the trend towards an improvement at T5. All symptoms (daily activity, edema, tiredness, shortness of breath), knowledge of the pathology, pleasure in living had improved at T5.

We compared the therapy at the time of admission (T0) with the 4th week post-hospitalization (T5) therapy. Compared to T0, the percentage of patients taking ARNI, Beta blockers, MRA, SGLT-2i had significantly increased at T5 (22 vs 80% p=0.0001, 63 vs 92% p=0.039, 40 vs 96% p=0.0001, 24 vs 96% p=0.0001 respectively). From T1 to T5 the percentage of patients on ARNI (55 vs 80% p=0.06) and on GLT2i (96 vs 100% p=ns) increased while the percentage of patients on beta-blockers and MRA remained unchanged. The diuretics therapy decreased (T1 77% vs T5 68%) (Figure 3). An analysis of the dosage reached for the single drug revealed that SGLT-2i and MRA achieved the maximum recommended dose (10mg and 50mg) in the 4th week of post hospitalization (T5 vs T0 p=0.000 and p=0.003 respectively). The dosage of ARNI and Beta blocker was increased during follow-up (T5 vs T0, ARNI p=0.001, Bisoprolol p=0.03) without, howev er, reaching that recommended by the guidelines. In fact, most patients maintained a low dosage of ARNI (50mg), Metoprolol (100mg), Bisoprolol (2.5mg) at the 4th week of post hospitalization (T5). The dosage of the diuretic at the 4th week of post hospitalization decreased significantly (T5 vs T1 Furosemide p= 0.02).

Figure 3: Optimization of Therapy sec. GDMT. Therapy from T0 to T5. % Patients



T0-T5: ARNI p=0.0001, ACEi p=0.219, Sartani p=0.500, Beta blockers p=0.039, Ivabradina p=0.625, MRA p=0.0001, SGLT2i p=0.0001, Vericiguat p=1.00, Diuretics p=0.754
T1-T5: ARNI p=0.063, ACEi p=1.00, Sartani p=0.500, Beta blockers-Ivabradina-MRA-SGLT2i-Vericiguat p=1.00, Diuretics p=0.625

ARNI angiotensin receptor/neprilysin inhibitor
ACEi angiotensin-converting enzyme (ACE) inhibitors
Sartani or AT1 antagonist
MRA mineralocorticoid receptor antagonist
SGLT2i sodium-glucose cotransporter-2 inhibitors

The symptoms at the admission such as orthopnea and dyspnea at rest had already disappeared at the time of pre-discharge (T0 vs T1 p=0.000). Exertional dyspnea and edema almost completely disappeared in the 4th week post-hospitalization (T1 vs T5 p=0.000 and p=0.005 respectively). The NYHA class also improved continuously from discharge to the end of post-hospitalization (T0 vs T5 p =0.000). Thanks to the clinical nursing monitoring form we recorded a drop in weight (T0 vs T5 p 0.002), in systolic blood pressure (p= ns) and in diastolic blood pressure (p= ns) over the 4 weeks.

From time T0 to T5 we recorded a continuous decrease in the Brain Natriuretic Peptide (BNP) (1141 vs 420 pg/ml, p=0.009) and in the carbohydrate antigen (CA 125) (101 vs 15 u/ml, p=0.012). Differently, in the same period, hemoglobin (HB) and the percentage of transferrin saturation improved (12 vs 13 mg/dl, p=0.008 e 10 vs 23 %, p=0.05 respectively). There were no significant changes in the creatinine clearance.

The HLPOCUs examination was carried out on admission (T0), before discharge (T1) and in the 4th week of post-hospitalization (T5). We recorded a continuous improvement of all useful parameters (table 2). The ejection fraction (EF) increased on average from 31% to 47% (T1 vs T5, p=0.001). Diastolic function, measured with the diastolic pattern and with the E/e' ratio, improved significantly from T1 to T5 (3 vs 2, p=0.013 and 20 vs 14 p=0.012 respectively). The indexed atrial volume, an indicator of intra atrial pressure, also improved in follow up (T1 54ml/m2 vs T5 45ml/m2 p=0.005). We therefore recorded, from T1 to T5, an improvement in all indicators of right ventricular function and systemic congestion: TAPSE (17 vs 23mm, p=0.000), PAPS (38 vs 25mmHg, p=0.000), VCI diameter (17 vs 11mm, p=0.001). Finally, the measurement of pulmonary congestion with the search for B lines in 8 zone confirmed the effectiveness of the interventions from T1 to T5 (10 vs 4, p=0.000) which had already begun after admission.

Table 2: Instrumental Data: Heart and Lungs Point of Care Ultrasound (HLPOCUs). T0, T1, T5

Data	T0	T1	T5	p T5 vs T0	p T5 vs T1
EF (%)	31	31	47	0.000	0.001
Pattern dyastolic	3	3	2	0.005	0.013
E/e	21	20	14	0.013	0.012
LAvol (ml/mq)	56	54	45	0.008	0.005
TRV (m/sec)	3	3	2	0.001	0.004
TAPSE mm	17	17	23	0.002	0.000
PAPS mHg	39	38	25	0.001	0.000
VCI mm	17	17	11	0.000	0.001
Line B n/8 zone	17	10	4	0.000	0.000

EF: ejection fraction; Pattern diastolic: E/A; TR: CW doppler TR systolic jet velocity; PAPS: pulmonary artery systolic pressures; E/e': mitral E/e'; e': pulsed wave TDI e' velocity; LA: left atrium maximum volume index; TAPSE: tricuspid annular plane systolic excursion; VCI: inferior cava vein diameter; Line B: n. line B/8 zone(fields)

A recording of the strongest outcomes has not yet been possible due to the short observation period and the small population size. However, thanks to the Hospital Management Control Service and the confirmation phone calls to the care givers, we recorded the following events due to heart failure (HF) occurred up to the 7th month after the 4th week of post hospitalization (T5). HF Hospitalizations: 2 in the first month, 1 in each third, fourth, fifth month. HF Deaths: 1 in each first and second month.

The following adverse events were recorded during follow-up: Erythema (1 patient), hypokalaemia (1 patient), hypotension (3 patients), acute renal failure (1 patient). None of these events required hospitalization.

As regards the secondary endpoints and thanks to the training, it was possible to administer both the digital clinical monitoring form (telenursing in T1-5) and the HLPOCUs path (in T0, T1, T5) to all 27 patients (100%).

Now, considering the low number of patients enrolled and the short follow up time, it is not possible to construct a prognostic score with clinical, instrumental and biochemical parameters.

Discussion

The transition phase, immediately after discharge from an episode of heart failure, is known to be a critical phase. In fact, the patient passes from a place protected by the supervision of health workers to a less controlled site at home [26]. In this same period the neurohormonal factors that led to the decompensation are not yet completely controlled so that the hemodynamic balance is still unstable. For these reasons and in the first 30 days after discharge the risk of a second hospitalization and/or access to the Emergency Department is very high (30%) [27]. To better manage this transition phase, it is necessary to titrate the therapy according GDMT to be started already during hospitalization, once the acute phase has passed, and in the days before discharge [28].

The P.E.A.C.H. program wants to verify whether the patient hospitalized for an episode of acute heart failure can be taken care, in the transition phase, by the healthcare professionals who treated him during the hospitalization phase. The advantages are various:
a) healthcare workers already know the patient's health, welfare and social problems
b) follow-up exams are scheduled in advance and quickly compared with those of the hospital stay
c) therapy is titrated and recorded in the same medical record
d) expense is covered by instruments already in possession

To achieve these goals, we have used tools that are easily available, economical and can be shared among all healthcare professionals. The first is training according to an improvement project. This allowed doctors

and nurses to be trained during working hours and until the required skills are achieved. The second tool is telemedicine understood as tele visit and telenursing. Thanks to this and for the transition phase we have remotely followed the patient discharged after an episode of acute heart failure. Also interacting with the care giver, if necessary, we recorded the clinical data on a specific clinical monitoring format and titrate the therapy, when possible, according to the guidelines (tele P.E.A.C.H.) [10,11]. The third tool is ultrasound focused on the heart and lung (HLPOCUs). We have measured the change in parameters for systolic, diastolic function, and pulmonary congestion before discharge and after the fourth week of post-hospitalization. These values allowed us to adequately modify the therapy according to guidelines [21-23]. All clinical, blood chemistry and instrumental parameters were recorded in a special database. Thanks to this, all patient information was easily available, and the data could also be used for scientific purposes (data P.E.A.C.H.).

After obtaining the favourable opinion of the Ethics Committee for Clinical Trials (March 2024) and to date (December 2024) we have enrolled 35 patients hospitalized for an episode of acute heart failure with reduced ejection fraction (HFrEF). We currently have the results of the first 27 patients. Such a low number can be explained by the type of patient admitted to the medical department: characterized by age, multi-pathology, dementia, fragility (including social).In fact, the patients enrolled have an average age of 77 years and a high percentage of pathologies associated with heart failure (renal failure in 52%, anaemia in 41%, diabetes and atrial fibrillation in 37%, et al) and a Barthel index of 50-60 points. Most of the patients were helped by care givers (80%). At admission (T0) the therapy was inadequate respect to guidelines (ARNI in 22%, SGLT2i in 24 %, Beta blockers in 60%, MRA in 40%). This could be explained both because at least 60% had not had a hospitalization for heart failure in the previous 12 months, and because of the comorbidities as already described.

The use of the KCCQ, also in digital format, allowed us to record the delta in perceived quality of life and clinical outcomes during follow up. At the end of the post-hospitalization period, we registered an improvement in the score in all patients, and 60% increased it by more than 30 points. Among the items that clearly improved there were: activities of daily living, tiredness, oedema, dyspnoea, awareness of the disease, pleasure in living and recreational activities.

The tele visit also allowed the therapy to be modified during follow-up. In fact, thanks to the recording of clinical, bio humoral and instrumental data, the percentage of patients treated with GDMT increased significantly (from T0 to T5): ARNI from 22 to 80%, beta blockers from 63 to 92%, MRA from 40 to 96%, SGLT2i from 24 to 100%. At the same time, the use of diuretics decreased. This trend already occurred in the days before discharge, once the acute phase had passed, as recommended by recent scientific evidence [20]. At pre-discharge (T1) the percentage of patients on SGLT2i and MRA was 96%, on beta blockers 92%, on ARNI 55%.

The optimal dose recommended by the guidelines was reached at T5 for SGLT2i and for MRA only (10mg in 92% and 50mg in 63% of patients respectively). Otherwise, that for ARNI and for beta blockers remained low at T5 (Sacubitril/Valsartan 50mg in 40%, Bisoprolol 2.5mg in 30% and Metoprolol 100mg in 15% of patients). In fact, we have intercepted the tendency towards hypotension and bradycardia via tele nursing. The data is common and due to the multi-pathologies and multi-therapies in use in patients admitted in internal medicine ward [21].

During the 4 weeks of follow up, thanks to the titration of the therapy, we recorded progressive clinical improvement via telenursing. At time T1 the orthopnoea and dyspnoea at rest, at time T5 the dyspnoea on exertion and the oedemas disappeared. The NYHA class also improved at time T5. In parallel we recorded at T5 time an improvement in bio humoral and instrumental data. The BNP value went from 1141 in T0 to 420 pg/ml in T5 (p=0.009), the CA 125 from 101 in T0 to 15 u/ml in T5 (p=0.012). While the former decreased more rapidly, the latter normalized after 4 weeks confirming their pathogenetic significance as a marker predominantly of left and right ventricular dysfunction respectively [24,25]. The improvement from T0 to T5 in the percentage of transferrin saturation and haemoglobin, due to ferric carboxy-maltose transfusions, contributed to get better the clinical and

the decongestion status as already described in the literature [30]. The most evident result, thanks to the titration of the therapy, was recorded for the change in instrumental data (HLPOCUs). The HLPOCUs algorithm includes a few easy-to-learn parameters, it is quick and repeatable by the same operator and between different operators. Its information is important not only to diagnose HF but also to better appreciate its severity, response to treatment and prognosis [22]. In our study the delta began already in the predischarge phase (T0 vs T1) and continued until the 4th week of post-hospitalization (T1 vs T5). We registered an increase in the EF (31 vs 47%), an improvement in the left ventricular filling pressure (E/e' 20 vs 14, LA vol index 54 vs 45 ml/mq) a reduction in the pulmonary congestion (VCI 17 vs 11mm, line B n/8zone 10 vs 4).

To date, due to the low number of participants and the short time that has elapsed, it is difficult to record the major outcomes. However, what we can register is that P.E.A.C.H. program via tele nursing has protected patients in the transition phase. Ninety days after the end of tele P.E.A.C.H. there were 3 hospitalizations (11% of patients) and 2 deaths (7% of patients) due to heart failure. Visits to the Emergency Room (E.R.) in the first 3 months were due to causes other than exacerbation of heart failure.

Adverse events recorded from T1 to T5 were few and did not lead to hospitalization or to visit E.R. Cases of erythema and hypotension were intercepted thanks to tele nursing and resulted in the suspension and/or reduction of Sacubitril/Valsartan. The blood tests carried out at time T5 recorded hypokalaemia in one patient and exacerbation of chronic renal failure in one other patient which were corrected without the need for hospitalization.

To date it is not possible to define a definitive prognostic score. In the coming months and until the end of the study (December 2025) the recording of clinical, bio humoral and HLPOCUs data in the transition phase will allow us to better identify the patient who, due to the severity of the disease, will need to be referred to the cardiologist specialist rather than to the general practitioner (appendix Table 3).

Table 3: A Hypothetical Prognostic Score Using Clinical, HLPOCUs and Laboratory Parameters (Delta T1-T5)

Parameters score (Delta T1 -T5)					
KCCQ n. (increase)	Values	**PAPS mmHg (reduction)**	Values	**BNP pg/ml (reduction)**	Values
< 10	3	0	3	<500	3
11-30	2	1-10	2	500-100	2
>30	1	>10	1	>1000	1
EF % (increase)		**VCI mm (reduction)**			
0	3	0	3		
1-10	2	1-10	2		
>10	1	>10	1		
E/e' n. (reduction)		**Linee B n/8 zone (reduction)**			
0	3	0	3		
1-5	2	1-10	2		
>5	1	>10	1		

Score total	
High risk	>14
Medium risk	8-14
Low risk	<8

EF: ejection fraction; PAPS: pulmonary artery systolic pressures; E/e': mitral E/e'; VCI: inferior cava vein diameter; Line B: n. line B/8 zone(fields); KCCQ: Kansas City Cardiomyopathy Questionnaire; BNP: Brain Natriuretic Peptide

During the follow up we recorded some critical issues of the P.E.A.C.H. program. Training is time consuming, and not all healthcare professionals joined the program, burdening the volunteers with work. The patient enrolled, due to age and comorbidities, needed care givers at home for the measurement of parameters and for the connection to the tele visit. At the beginning of the study the digital devices were not performing and some tele communication problems occurred.

Conclusions

In this short period of observation, the P.E.A.C.H. program allowed us to draw some conclusions. Tele medicine (tele visit and tele nursing) has proven to be an easy-to-use tool in the post-hospitalization transition phase after an acute heart failure episode. The same tool allows healthcare professionals (nurses and physicians) to verify therapeutic adherence and optimize therapy according to GDMT. Telenursing in post-hospitalization is appreciated and easily used by patients. The digital format for clinical monitoring, the use of ultrasound focused on the heart and lungs (HLPOCUs) are quickly learned by healthcare professionals, they can monitor the state of congestion and record the prognostic parameters of the patient. The 30-day follow-up served to protect the patient in the transition phase. An internal medicine clinic dedicated to heart failure in the elderly would guarantee better care after one month of the tele nursing monitoring [22-31].

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