

Actualités sur la prise en charge de l'amylose cardiaque en Gériatrie

Dr Amaury BROUSSIER, MD PhD

Service de Gériatrie Ambulatoire – Unité de Cardio Gériatrie

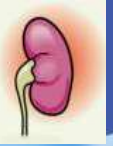
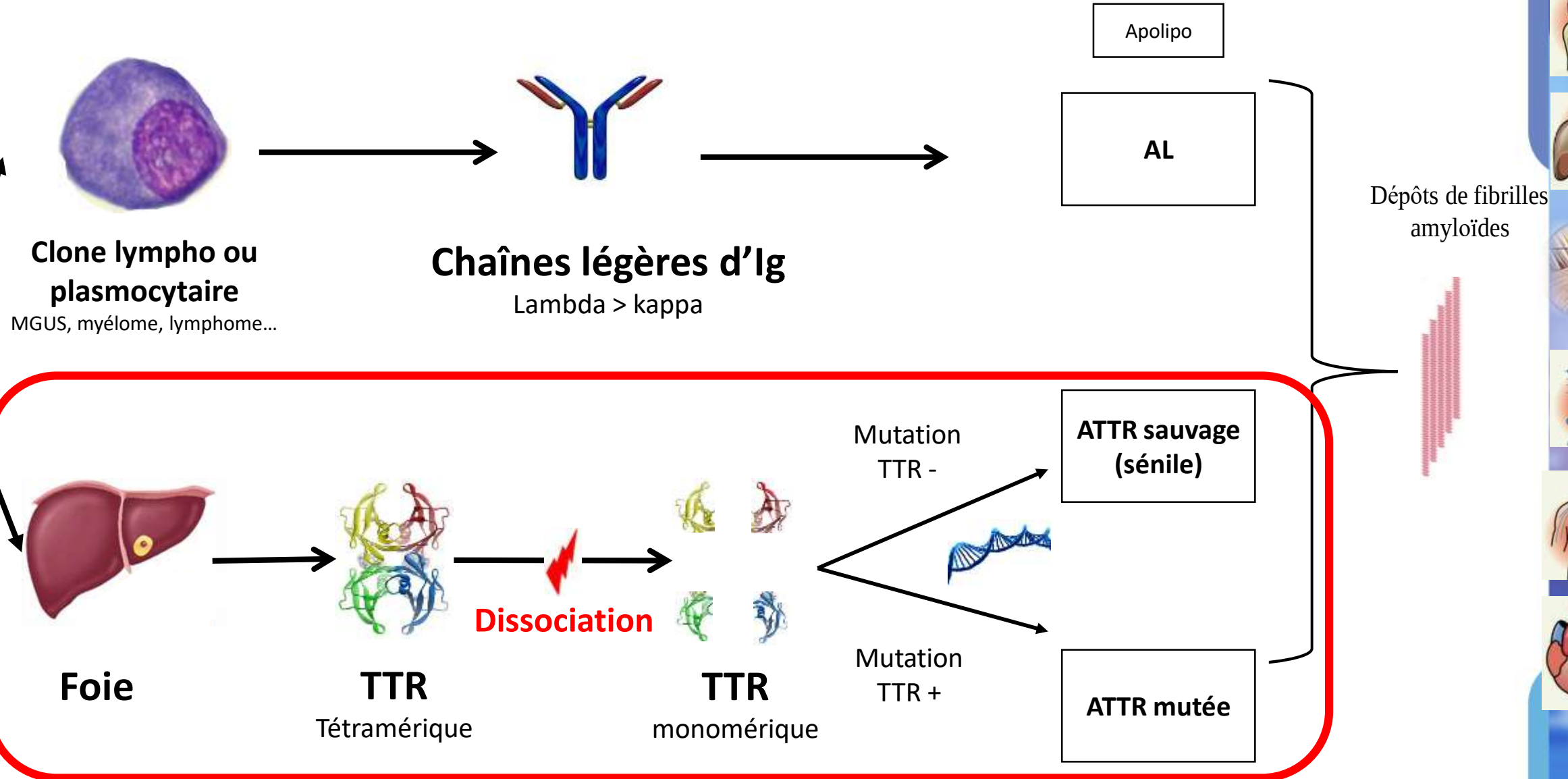
DMU de Gériatrie, Hôpital Emile Roux

GHU-APHP Henri Mondor

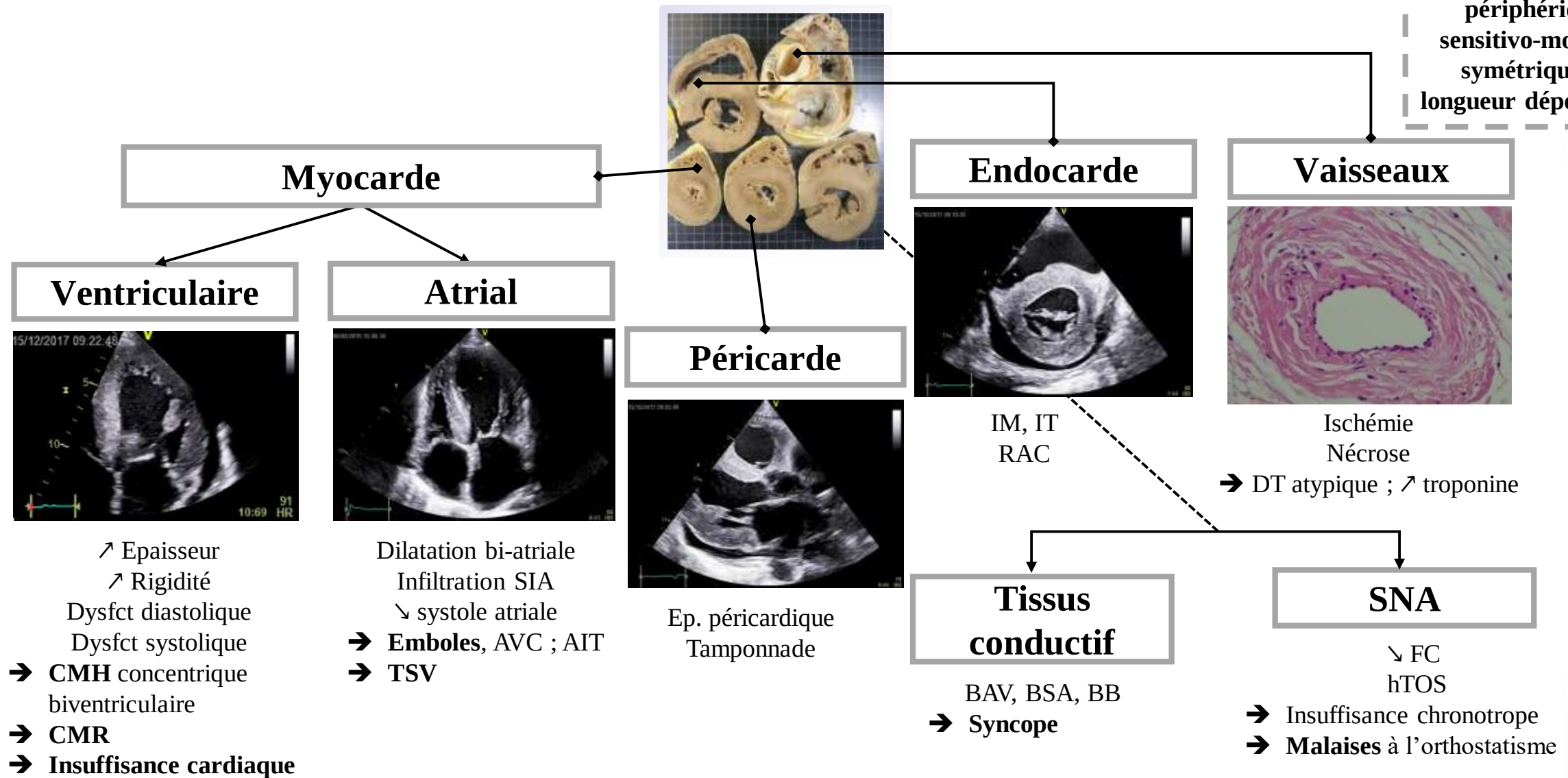
Equipe CEpiA (Clinical Epidemiology and Ageing), IMRB, U955 Inserm-Université Paris Est Créteil (UPEC)

Liens d'intérêts

Société	Type d'affiliation	Période
Novartis	Consulting, Formations	En cours
Vifor	Consulting	2020-2022
Pfizer	Consulting, Formations, Boards	En cours
Astra Zeneca	Consulting, Formations, Boards	En cours
Boehringer	Formations	En cours



± Neuropathie
périphérique
sensitivo-motrice,
symétrique et
longueur dépendante

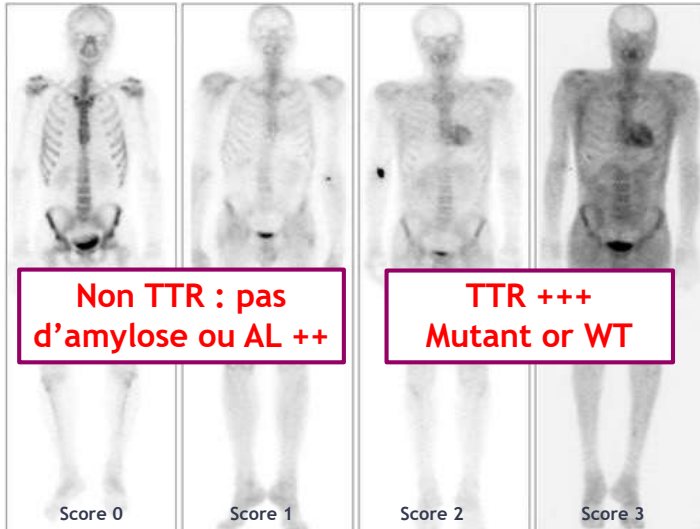
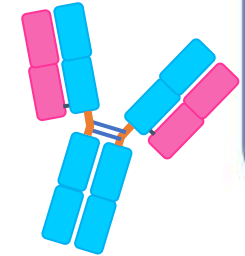


Examens morphologiques à la recherche d'arguments en faveur : ECG, ETT, IRM

Scintigraphie osseuse
(HMDP, DPD, PYP)

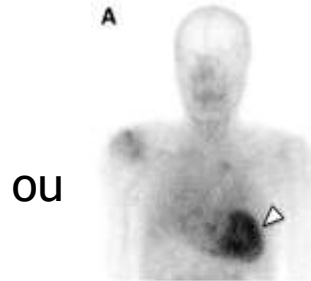
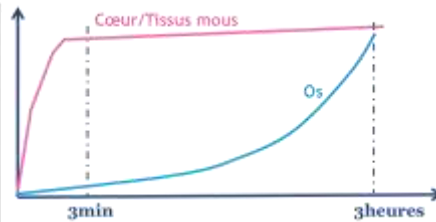
& Bilan de gammopathie monoclonal complet

- EPP, IF
- EPU, IEPU (= Bence Jones)
- Dosage des chaînes légères libres circulantes



Non TTR : pas
d'amylose ou AL ++

TTR +++
Mutant or WT



Electrophorèse des protides sériques : pic, hypogamma, normale

Immunofixation : plus sensible que l'électrophorèse

Dosage des chaînes légères libres sériques : plus sensible que l'immunofixation. Dépend du niveau de production (plasmocyte) et d'élimination (rein)

Recherche d'une protéinurie de Bence Jones

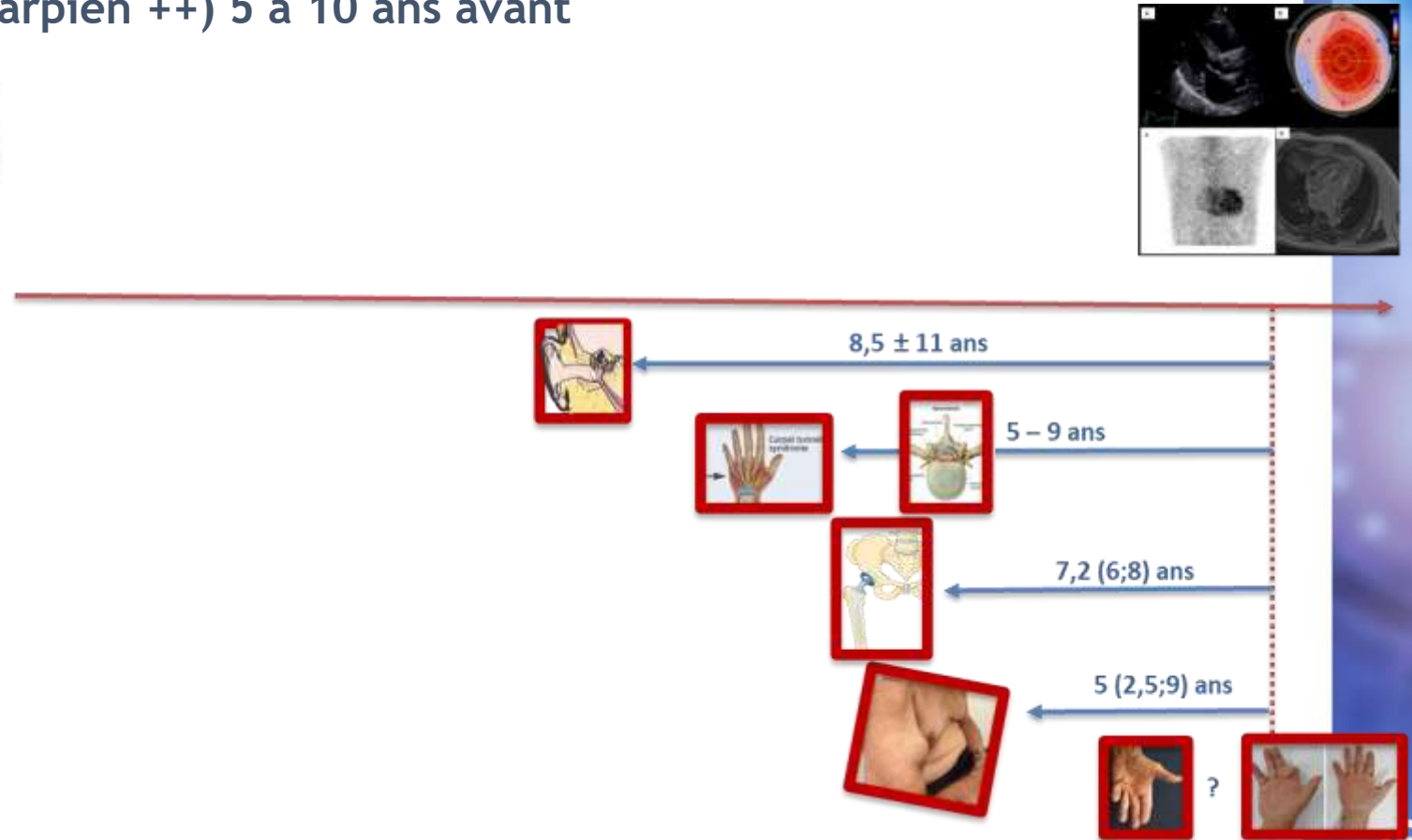
Pas de fixation cardiaque & fixation osseuse normale

Forte fixation cardiaque & extinction de la fixation osseuse

Score visuel de Perugini : en faveur d'une ATTR si ≥ 2

Ratio (précoce) cœur / médiastin : en faveur d'une ATTR $> 1,2$

- Age d'apparition des symptômes cardiaques : 78 ans
- Symptômes extra-cardiaques (canal carpien ++) 5 à 10 ans avant
- Hommes 90%
- Prévalence sous-estimée
 - Dépôts d'amylose TTR sauvage $\approx$ 25% des plus de 80 ans (séries autopsiques)
- Mais de plus en plus reconnue



Spécificités du traitement non spécifique

CHADS-TOP

Conduction

Mort subite : très fréquente quelque soit le type d'amylose : dissociation électro-mécanique, parfois TV/FV

Prévalence élevée des troubles conductifs

→ **Discussion implantation PM / DAI sur troubles conductifs de bas degré / sévérité**

Haute FC

Débit cardiaque = FC x VES

Cardiopathie restrictive donc VES constant : fréquence dépendance pour augmenter le débit

→ **Pas de bradycardisant (sauf amiodarone), PM pour insuffisance chronotrope**

Anticoagulation

Risque cardio-embolique élevé (même en rythme sinusal) → **rechercher les indication à une anticoagulation (sd néphrotique, ATCD cardioembolique, profil mitral restrictif)**

Dosage facteur X pour pondérer le risque hémorragique

Diurétiques

Nécessaire pour la congestion mais marge thérapeutique étroite compte tenu du risque de dysautonomie

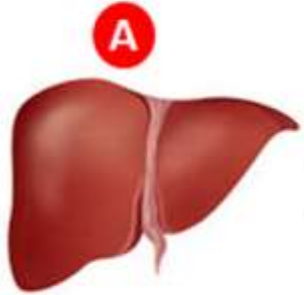
S-TOP BB, IEC,

Arrêt des traitements potentiellement délétères :

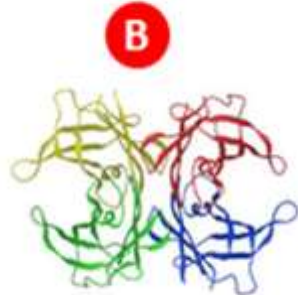
BB (bradycardie, inotrope -), Hypotenseurs (dysautonomie),

Digoxine (accumulation dans les fibrilles amyloïdes), Sacub/Valsartan

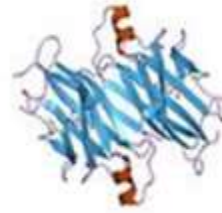
Synthèse hépatique



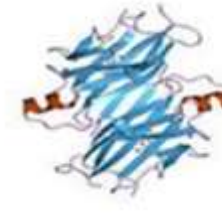
Homo tétramère



Monomère



Mauvais repliement



Fibrilles amyloïdes

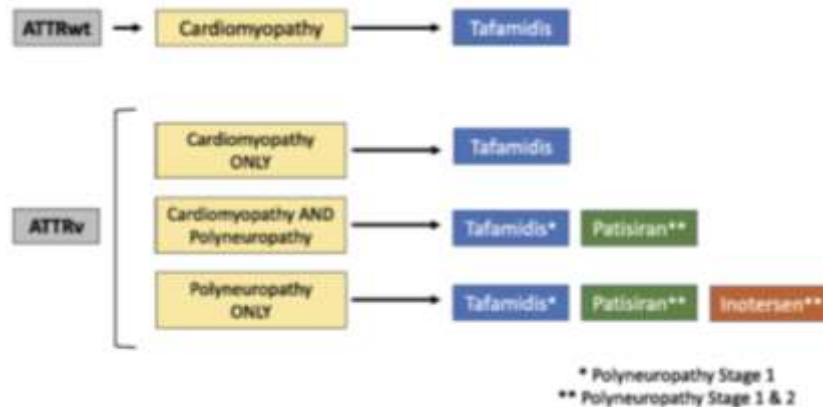


- A** Supprimer la TTR amyloïdogénique
- B** Stabiliser le tétramère
- C** Dégrader les fibrilles amyloïdes

➡ siRNA : ARN interférant (ATTRwt et ATTRv) : APPOLLO B

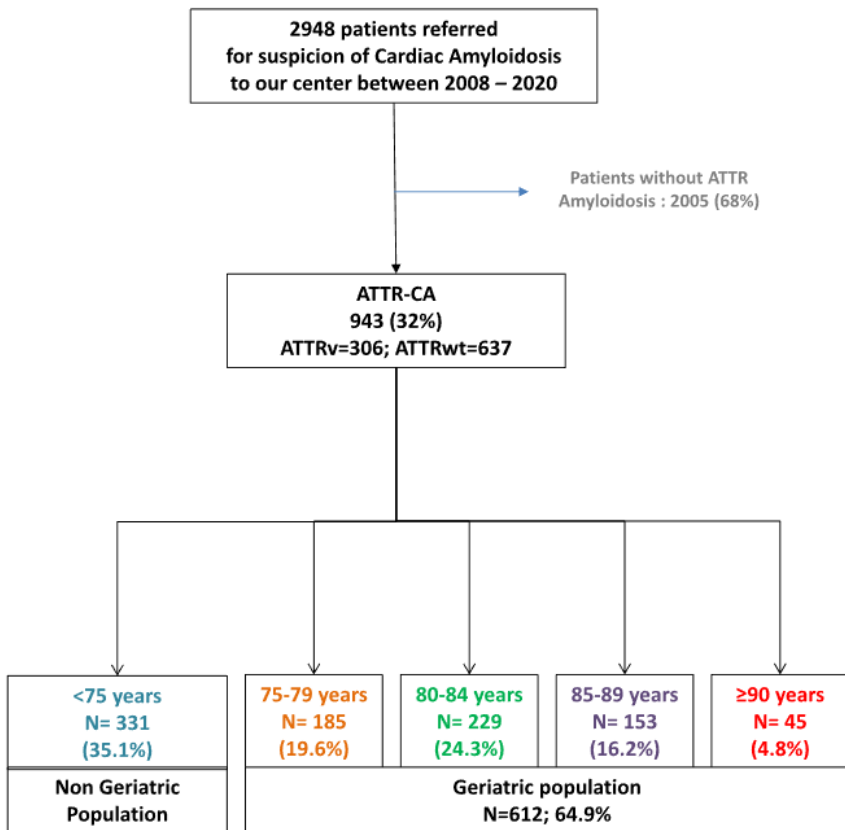
➡ Stabilisateur du tétramère : tafamidis RTU initiale, AMM 06/2021

➡ AC anti TTR : études en cours

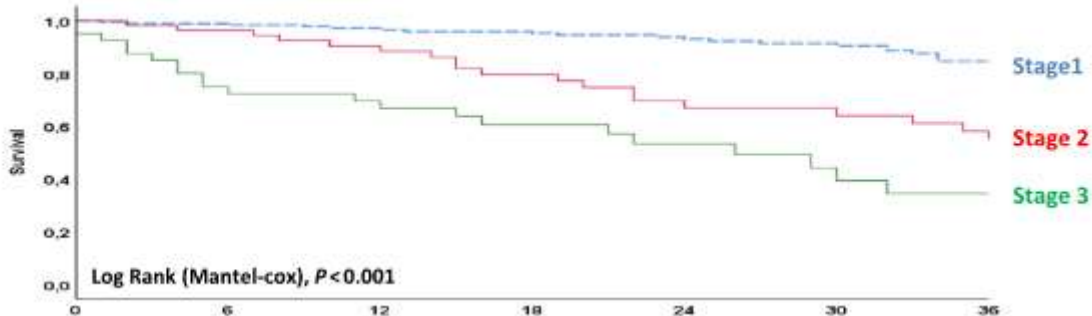


Phenotype and prognostic factors in geriatric and non-geriatric patients with transthyretin cardiomyopathy

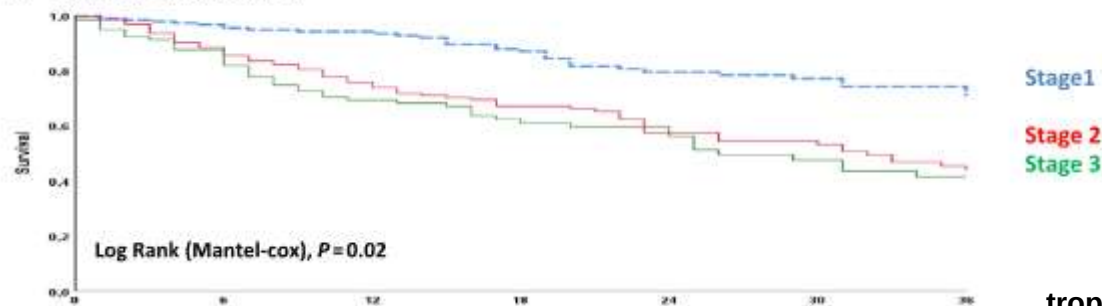
Eugenia Volpentesta^{1,2}, Mounira Kharoubi^{3,4,5,6}, Cristiano Donadio⁴, Kahina Rebai^{7,8}, Pascale Fanen³, Benoit Funalo^{3,7}, Thierry Gendre^{9,10}, Vincent Audard^{8,10}, Florence Canoui-Poitrine^{8,11,12}, Emmanuel Jitl^{8,13,14}, Emmanuel Teiger^{8,15,16}, Violaine Planté-Bordeneuve^{8,9}, Silvia Oghina^{3,9}, Denis Tixier^{8,9}, Sophie Mallet^{8,9}, Amaury Brousseau^{11,15}, Thibaud Damy^{3,4,5,6,11} and Amira Zarou^{3,4,5,6,11}



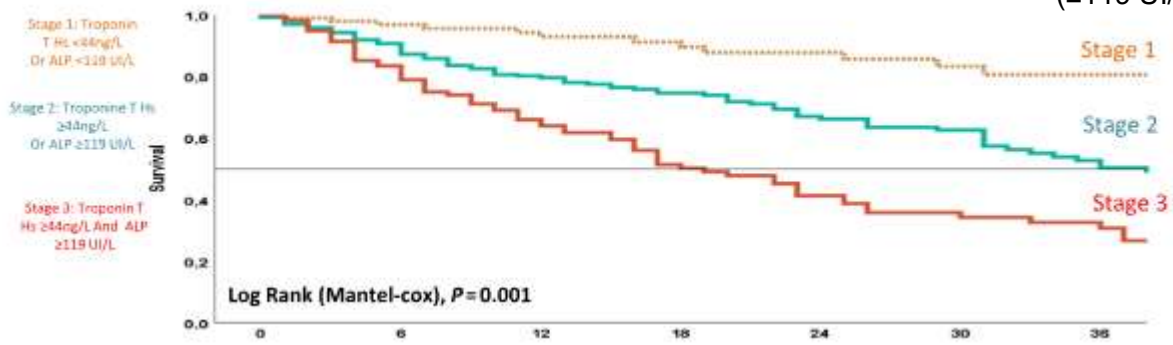
(A-i) NAC - Non Geriatric population



(A-ii) NAC - Geriatric population



(B) New Geriatric cardiac amyloidosis staging (GCA) : for Geriatric population



troponin T hs
(≥44 ng/L) and
ALP levels
(≥119 UI/L)

Article

Estimating the Prevalence of Cardiac Amyloidosis in Old Patients with Heart Failure—Barriers and Opportunities for Improvement: The PREVAMIC Study

- A total of 453 patients ≥ 65 years with HF and an interventricular septum or posterior wall thickness > 12 mm were included.
- All patients underwent a 99mTc-DPD/PYP/HMDP scintigraphy and monoclonal bands were studied, following the current criteria for non-invasive diagnosis.

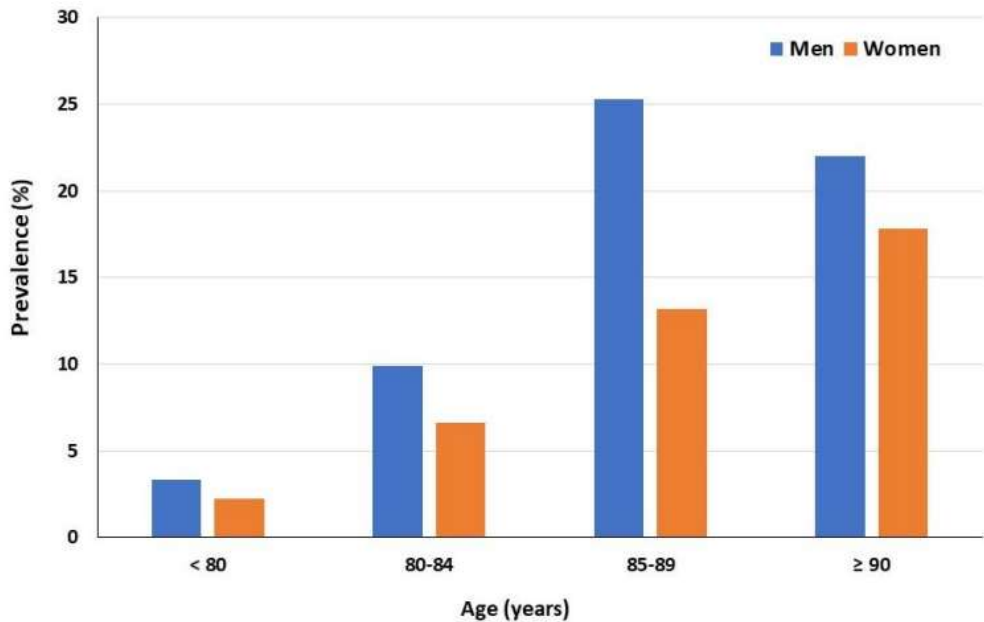
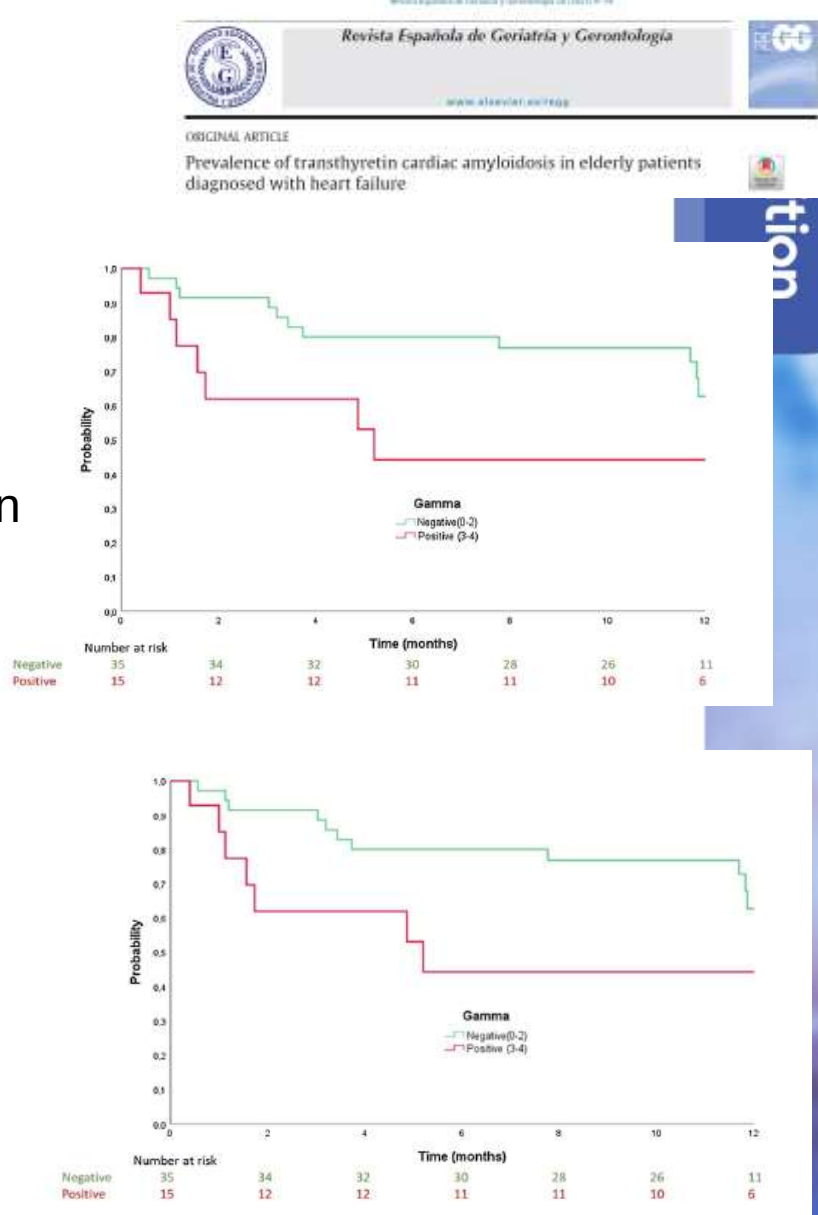


Figure 2. Cardiac amyloidosis prevalence according to age and sex.

The prevalence was **20.1%**. Most of the CA were transthyretin (**ATTR-CM**, 84.6%), with a minority of cardiac light-chain amyloidosis (AL-CM, 2.2%).

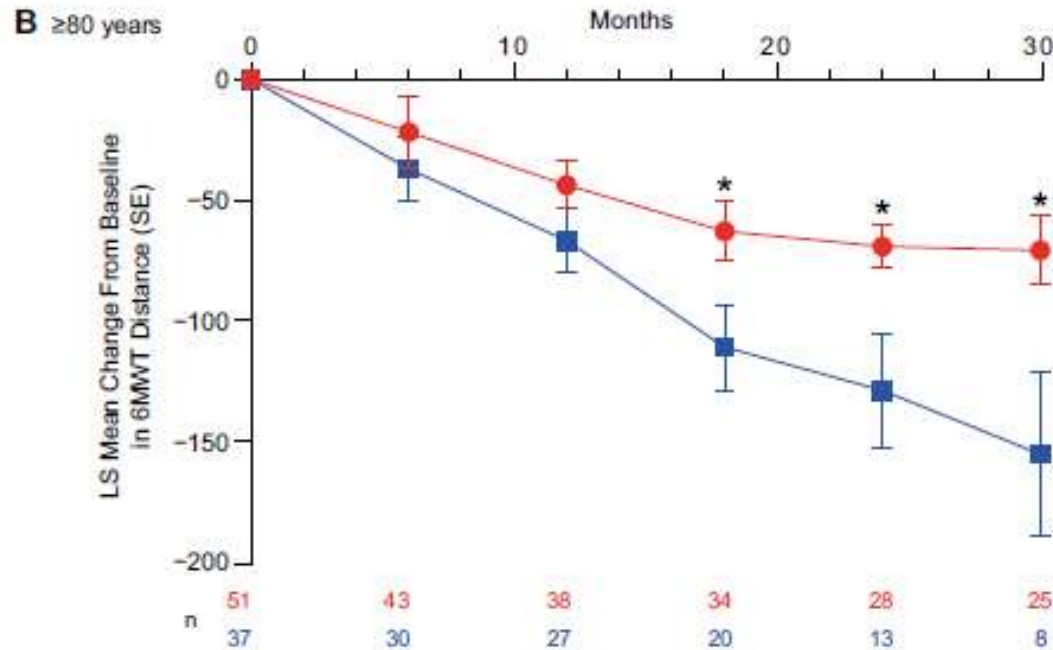
Death and
HF
Readmission

HF
Readmission



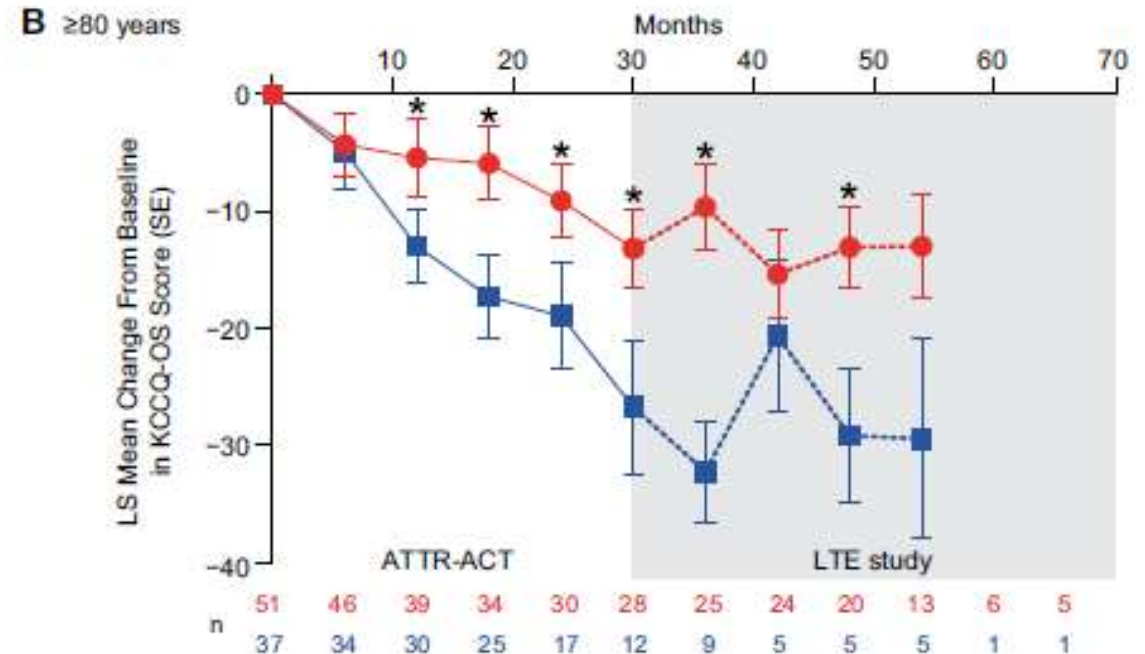
Tafamidis Efficacy Among Octogenarian Patients in the Phase 3 ATTR-ACT and Ongoing Long-Term Extension Study

Pablo Garcia-Pavia, MD, PhD,^{a,b,c} Marla B. Sultan, MD, MBA,^d Balarama Gundapaneni, MS,^e Yoshiki Sekijima, MD,^f
Federico Peretto, MD,^g Mazen Hanna, MD,^h Ronald Witteles, MDⁱ



6-MWT

Patients aged ≥80 years
51 received tafamidis and 37 received placebo



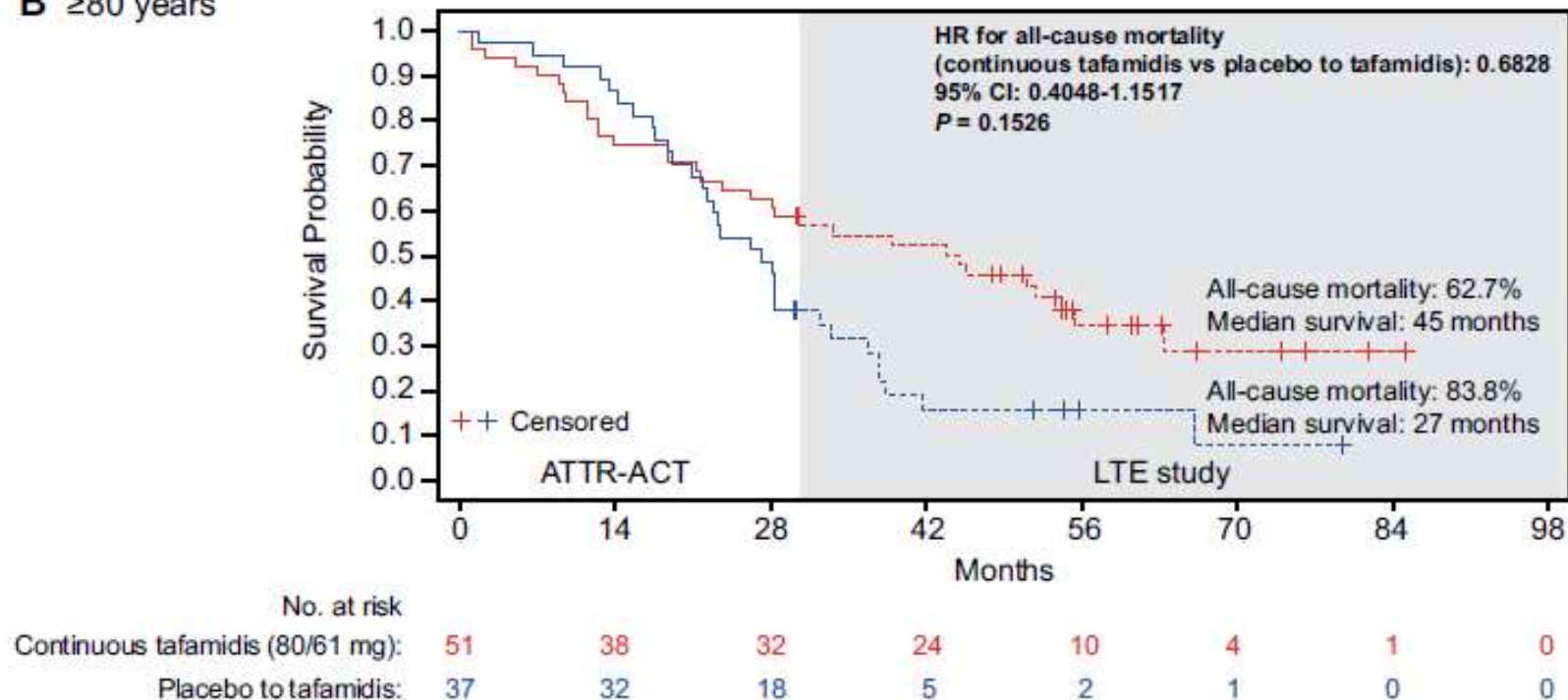
Quality of life

Tafamidis Efficacy Among Octogenarian Patients in the Phase 3 ATTR-ACT and Ongoing Long-Term Extension Study

Pablo Garcia-Pavia, MD, PhD,^{a,b,c} Marla B. Sultan, MD, MBA,^d Balarama Gundapaneni, MS,^e Yoshiki Sekijima, MD,^f Federico Peretto, MD,^g Mazen Hanna, MD,^h Ronald Witteles, MDⁱ

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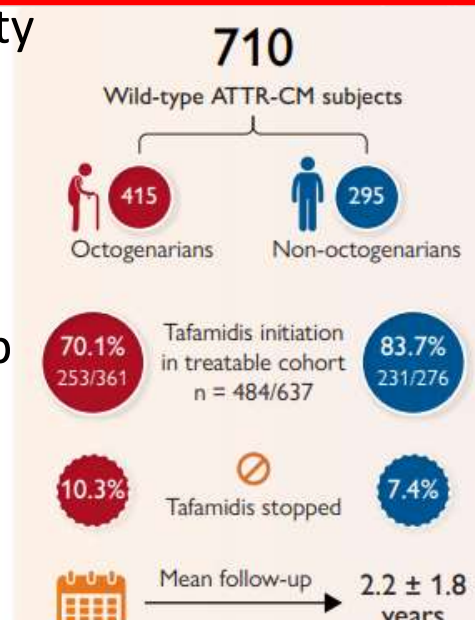
B ≥80 years



Tafamidis in octogenarians with wild-type transthyretin cardiac amyloidosis: an international cohort study

- The impact of tafamidis treatment on mortality in real-world wild-type transthyretin cardiomyopathy octogenarians was studied.
- An international, multicentre cohort study of 710 consecutive wild-type transthyretin cardiomyopathy patients with mean follow-up of 2.2 ± 1.8 years for all-cause mortality endpoint was performed.
- 58.5% (415/710) octogenarians (85 ± 4 years, 74.2% male)

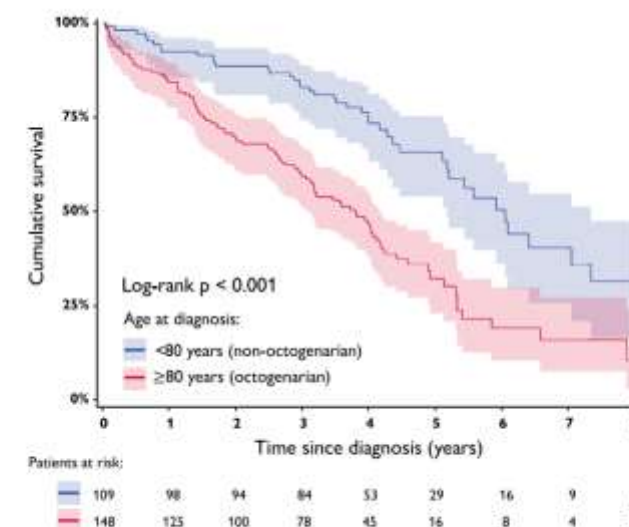
	Overall cohort n = 710	Non-octogenarians n = 295	Octogenarians n = 415	P-value
Demographics				
Age, years	[710] 81 ± 7	[295] 74 ± 5	[415] 85 ± 4	<.001
Male	566/710 (79.7%)	258/295 (87.5%)	308/415 (74.2%)	<.001



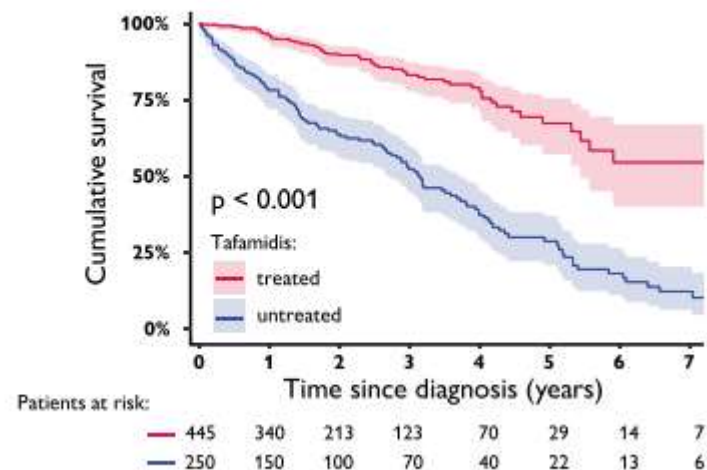
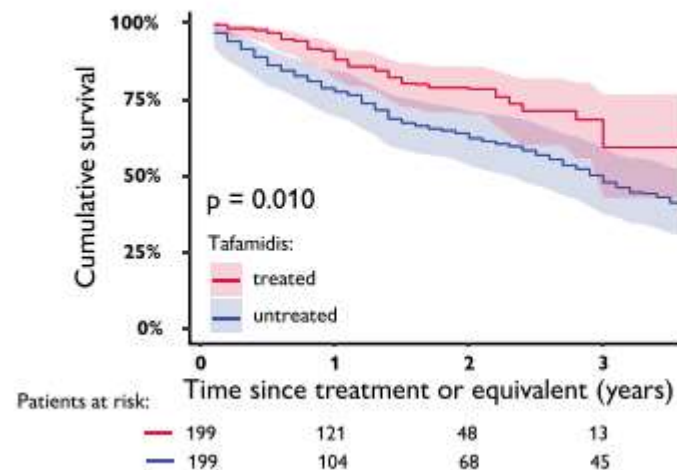
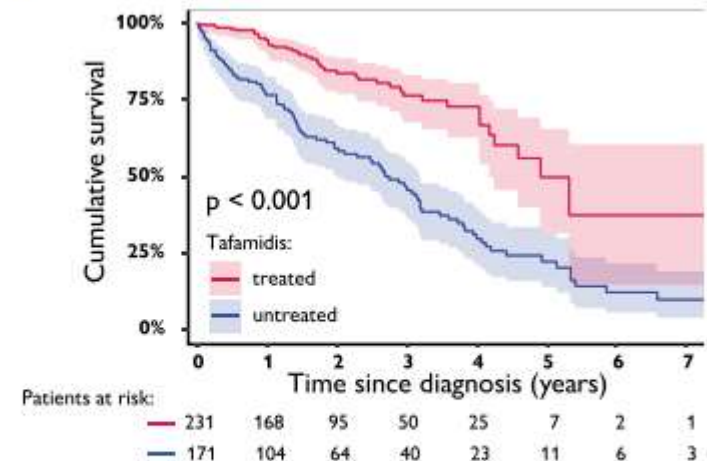
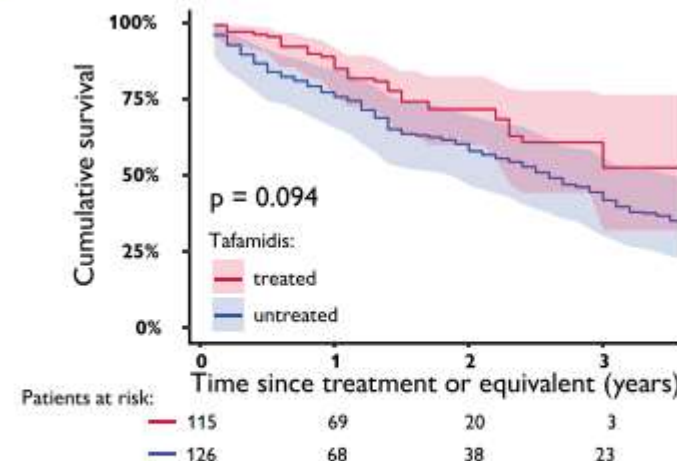
We demonstrated **poor overall survival** in untreated octogenarians with high 1- and 5-year mortality rates of 16% and 71%, respectively, and a median survival of 3.8 years

Table 3 Reasons for tafamidis discontinuation in treated patients

Principal reason	Overall n = 43	Non-octogenarians n = 17	Octogenarians n = 26
Progressive disease, advanced heart failure	17 (39.5%)	7 (41.2%)	10 (38.5%)
Undefined reason	8 (18.6%)	2 (11.8%)	6 (23.1%)
Comorbidities, cognitive decline and/or frailty	5 (11.6%)	2 (11.8%)	3 (11.5%)
Advanced age, presumed futility	3 (7.0%)	0 (0.0%)	3 (11.5%)
Side-effects	7 (16.3%)	4 (23.5%)	3 (11.5%)
Patient preference	2 (4.7%)	2 (11.8%)	0 (0%)
Early disease stage, no heart failure	1 (2.3%)	0 (0.0%)	1 (3.8%)



all course cohort cumulative survival, stratified by octogenarians and non-octogenarians

Tafamidis in octogenarians with wild-type transthyretin cardiac amyloidosis: an international cohort study**A** Total study population: overall**C** Propensity score-matched population: overall**B** Total study population: octogenarians**D** Propensity score-matched population: octogenarians**Figure 3** Cumulative survival in tafamidis treated vs. untreated patients. Total patient population. (A) Overall cohort. (B) Octogenarian cohort. Propensity score-matched population, with patients at risk from the first imputation. (C) Overall cohort. (D) Octogenarian cohort

Propensity score
matching on
baseline variables,
including **age**,
**National
Amyloidosis Centre
stage**, and **New
York Heart
Association class**

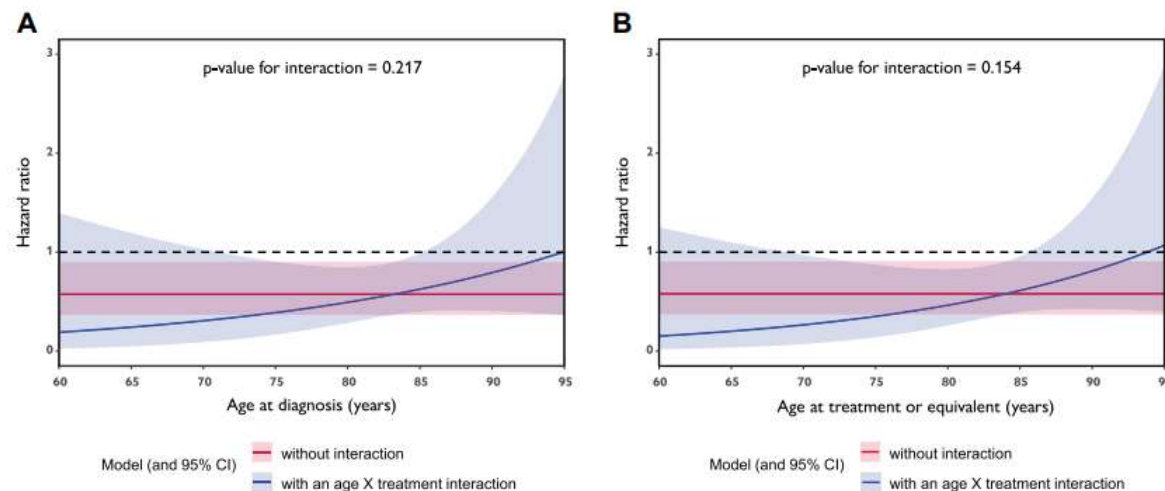
Tafamidis in octogenarians with wild-type transthyretin cardiac amyloidosis: an international cohort study

Figure 4 Age interaction with tafamidis treatment efficacy (mortality). (A) Interaction with age at diagnosis. (B) Interaction with age at start treatment (or equivalent). CI, confidence interval

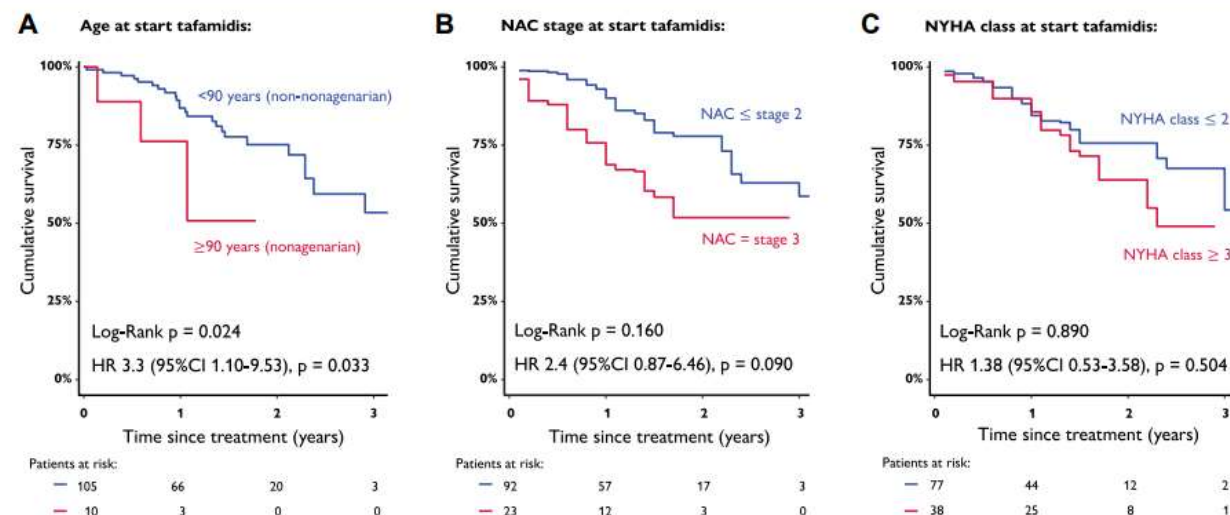
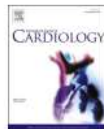


Figure 5 Cumulative survival in tafamidis treated octogenarians, since treatment. (A) Stratified by nonagenarian and non-nonagenarian. (B) Stratified by National Amyloidosis Centre prognostic stage category. (C) Stratified by New York Heart Association functional class category. CI, confidence interval; HR, hazard ratio; NAC, National Amyloidosis Centre; NYHA, New York Heart Association



Impact of Tafamidis on survival in elderly patients: Insights from the Healthcare European Amyloidosis Registry

- **Our aim** was to analyze clinical characteristics and survival of patients with ATTR-CM aged ≥ 80 years diagnosed after November 2018, treated with tafamidis 80/61 mg, and compare them with a non-treated group diagnosed before that date.
- Data from the two groups were extracted from the **Healthcare European Amyloidosis Registry (HEAR)**. Propensity score matching was used to adjust for baseline differences between the groups

- Between June 2021 and June 2024, the HEAR cohort included 6051 patients with amyloidosis, of whom 4310 were diagnosed with ATTR-CM. Among these, **1380 patients were over 80 years old**. Of the patients over 80 years old, **1194 were diagnosed after November 2018 and treated with tafamidis 80/61 mg, while 186 patients were diagnosed before November 2018 and were not treated**.
- Treated patients were older (**86 vs. 83 years**, $p < 0.001$) and significantly **less severe at baseline**, with a significantly lower occurrence of NYHA class III-IV compared to the untreated group (23.5 % vs. 45.5 %, $p < 0.001$).

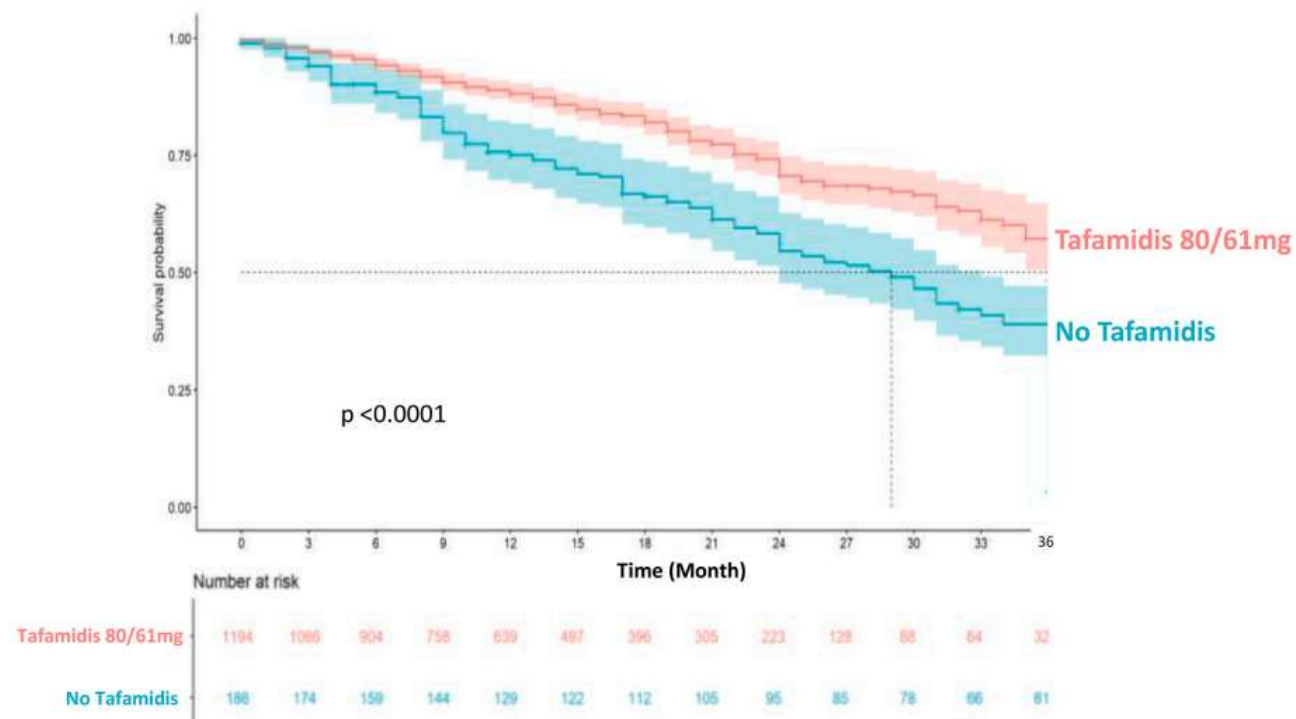
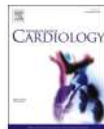


Fig. 1. Survival in patients over 80 years old treated with tafamidis 80/61mg versus no treatment: Kaplan-Meier curve.



Impact of Tafamidis on survival in elderly patients: Insights from the Healthcare European Amyloidosis Registry

The **propensity score** was estimated based on the following parameters: age, NYHA, systolic blood pressure, troponin T HS, NT-proBNP, Interventricular Septal Thickness (IVST), LVEF, E/ e'ratio, Aspartate Aminotransferase (ASAT), and Alkaline Phosphatase (ALP).

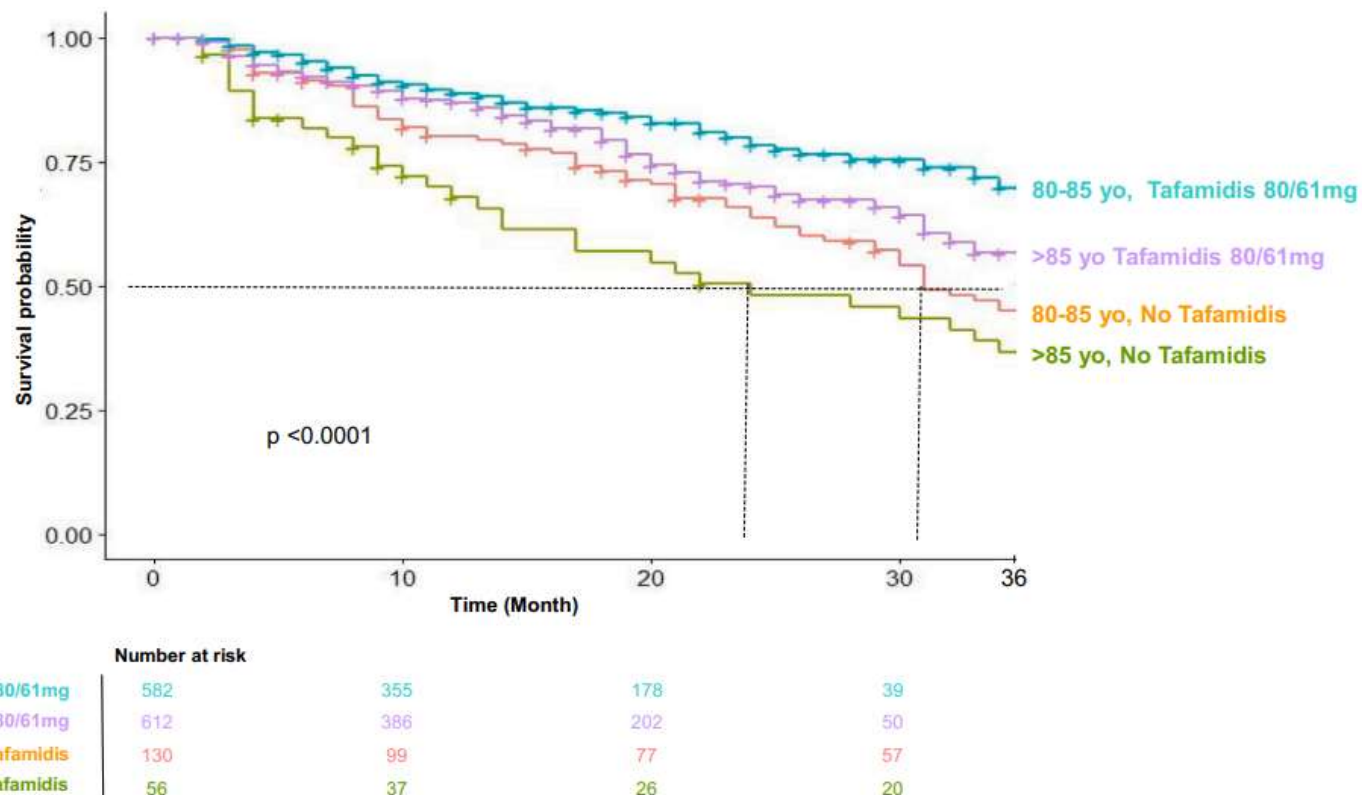
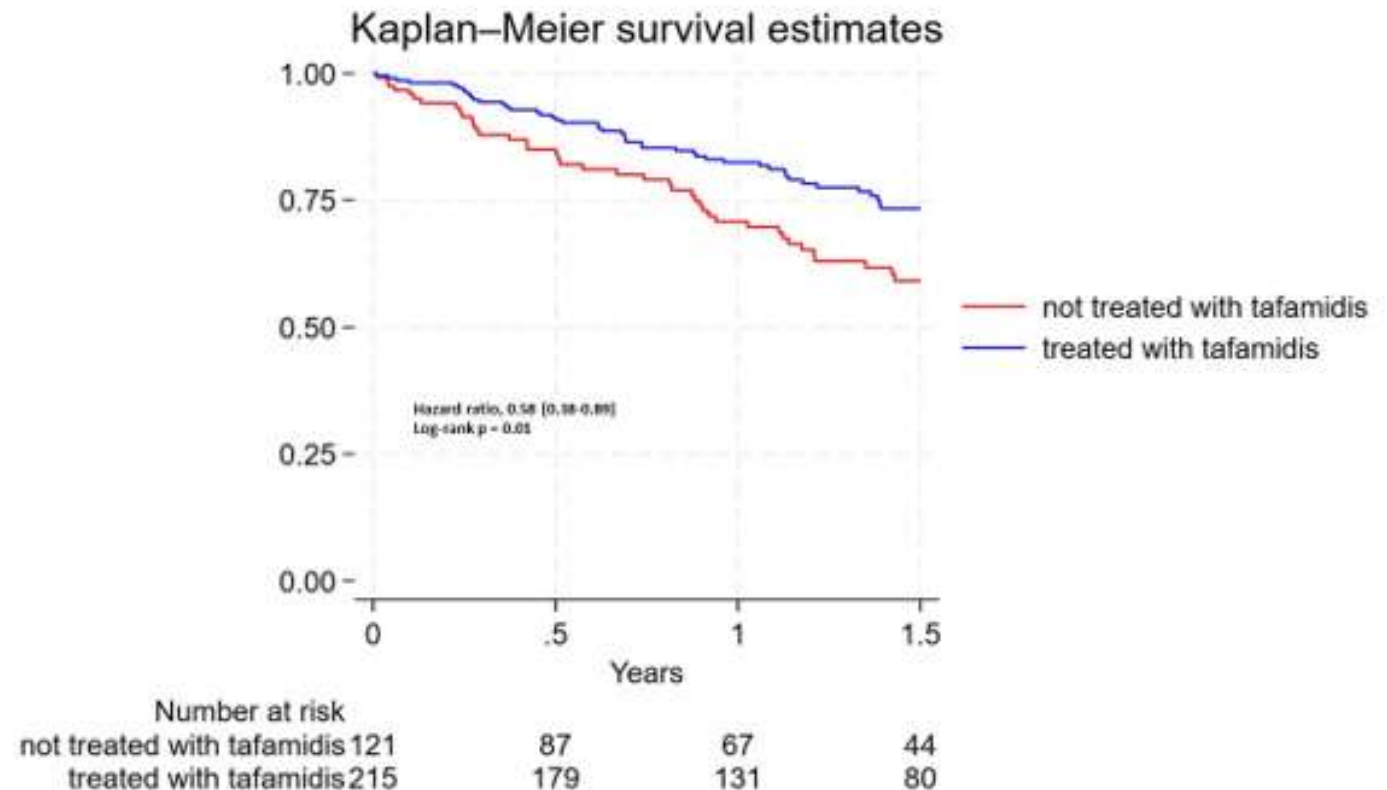


Fig. 2. Survival in patients over 80 years old treated with tafamidis 80/61 mg versus no treatment based on age class (80–85 vs >85 years): Kaplan-Meier curve.

Nonagenarian patients with ATTR cardiac amyloidosis: should they be treated with tafamidis?

Antoine Jobbé-Duval ^{1,*}, Thibaud Damy ^{2,3,4}, and Amaury Broussier ^{4,5}

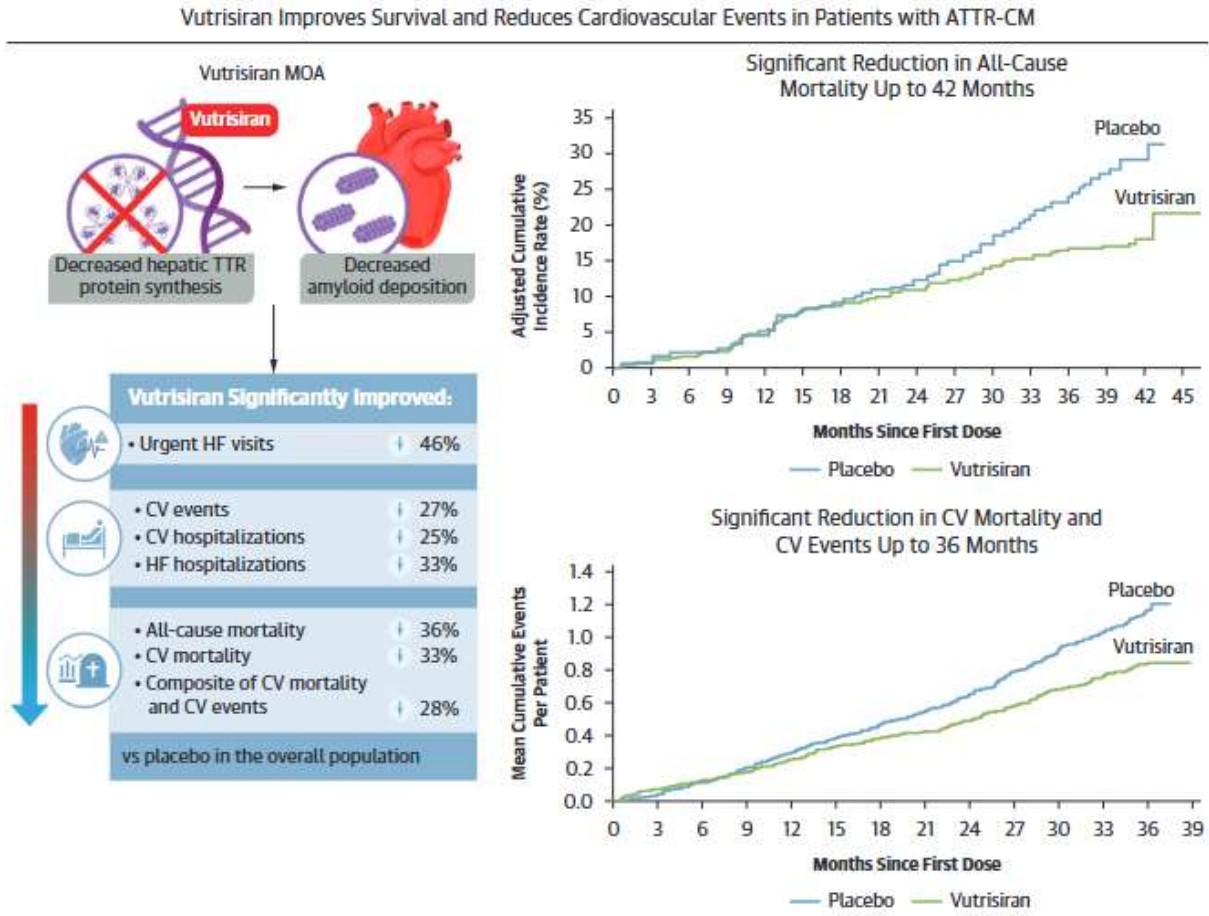
- **336 patients over the age of 90**
- males: 69%; median hypertrophy: 16 mm, median ejection fraction: 55%; median ventricular strain: -11%; median serum level : median serum N-terminal prohormone of brain natriuretic peptide level: 3438 pg/ml; National Amyloidosis Centre (NAC) stage 2: 44%; NAC stage 3: 24%)



Vutrisiran Improves Survival and Reduces Cardiovascular Events in ATTR Amyloid Cardiomyopathy

HELIOS-B

CENTRAL ILLUSTRATION Vutrisiran Reduces the Risk of Mortality and Cardiovascular Events Among Patients With Transthyretin Amyloidosis With Cardiomyopathy



Witteles RM, et al. JACC. 2025;85(20):1959-1970.

ATTR-CM = transthyretin amyloidosis with cardiomyopathy; CV = cardiovascular; HF = heart failure; MOA = mechanism of action; TTR = transthyretin.

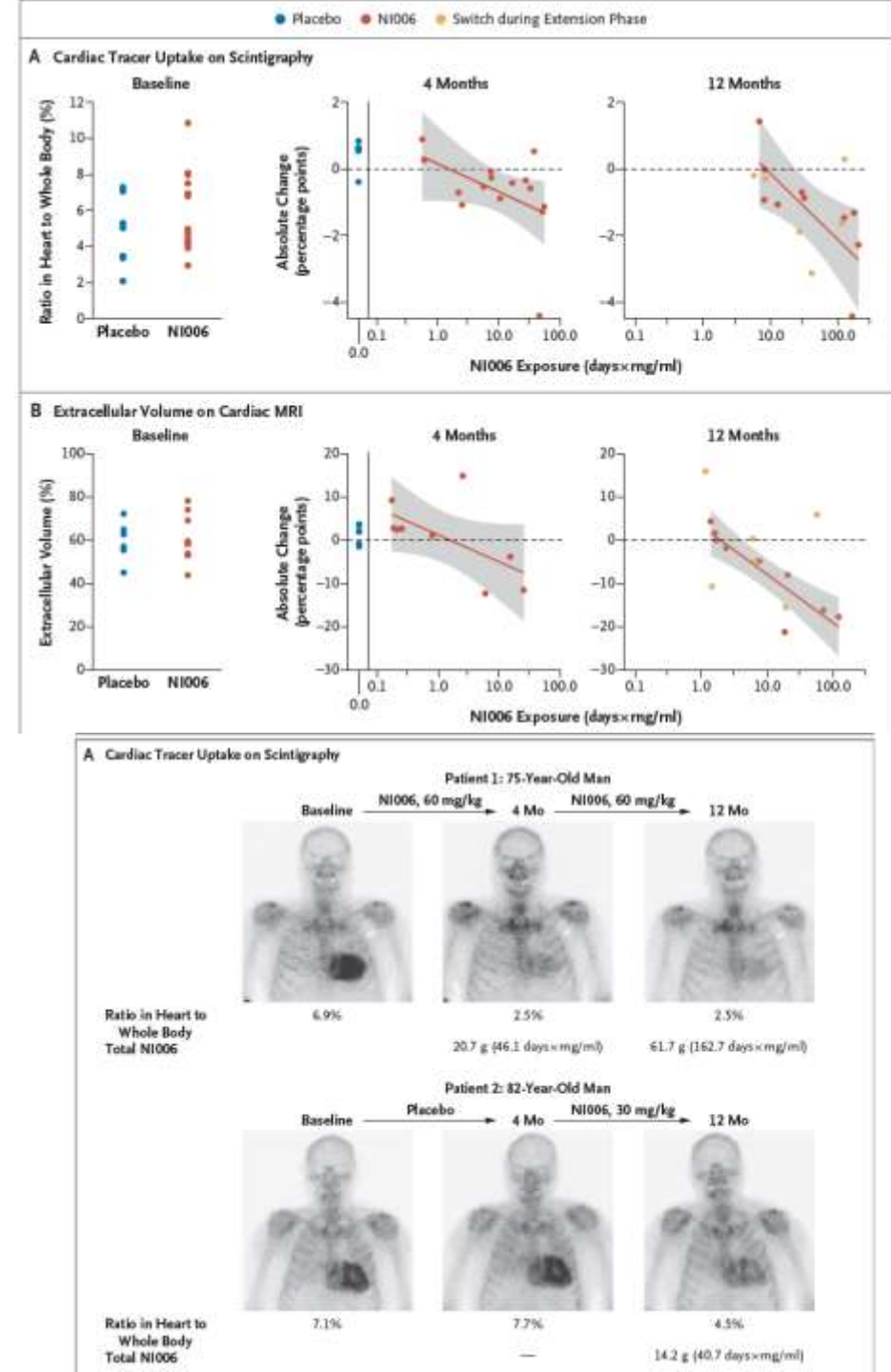
ORIGINAL ARTICLE

Phase 1 Trial of Antibody NI006 for Depletion of Cardiac Transthyretin Amyloid

Pablo Garcia-Pavia, M.D., Ph.D., Fabian aus dem Siepen, M.D.,
 Erwan Donal, M.D., Ph.D., Olivier Lairez, M.D., Peter van der Meer, M.D., Ph.D.,
 Arnt V. Kristen, M.D., Michele F. Mercuri, M.D., Ph.D., Aubin Michalon, Ph.D.,
 Robert J.A. Frost, M.D., Ph.D., Jan Grimm, Ph.D., Roger M. Nitsch, M.D.,
 Christoph Hock, M.D., Peter C. Kahr, M.D., and Thibaud Damy, M.D., Ph.D.

- In this **phase 1**, double-blind trial, we randomly assigned (in a 2:1 ratio) 40 patients with wild-type or variant ATTR cardiomyopathy and chronic heart failure
- Intravenous infusions of either **NI006** or **placebo** every 4 weeks for 4 months (ranging from 0.3 to 60 mg per kilogram of body weight).
- After four infusions, patients were enrolled in an **open-label extension phase** in which they received eight infusions of NI006 with stepwise increases in the dose.
- **The safety and pharmacokinetic profiles** of NI006 were assessed, and cardiac imaging studies were performed.

Garcia-Pavia et al., NEJM 2023.



Clinical Phenotype and Prognostic Significance of Frailty in Transthyretin Cardiac Amyloidosis

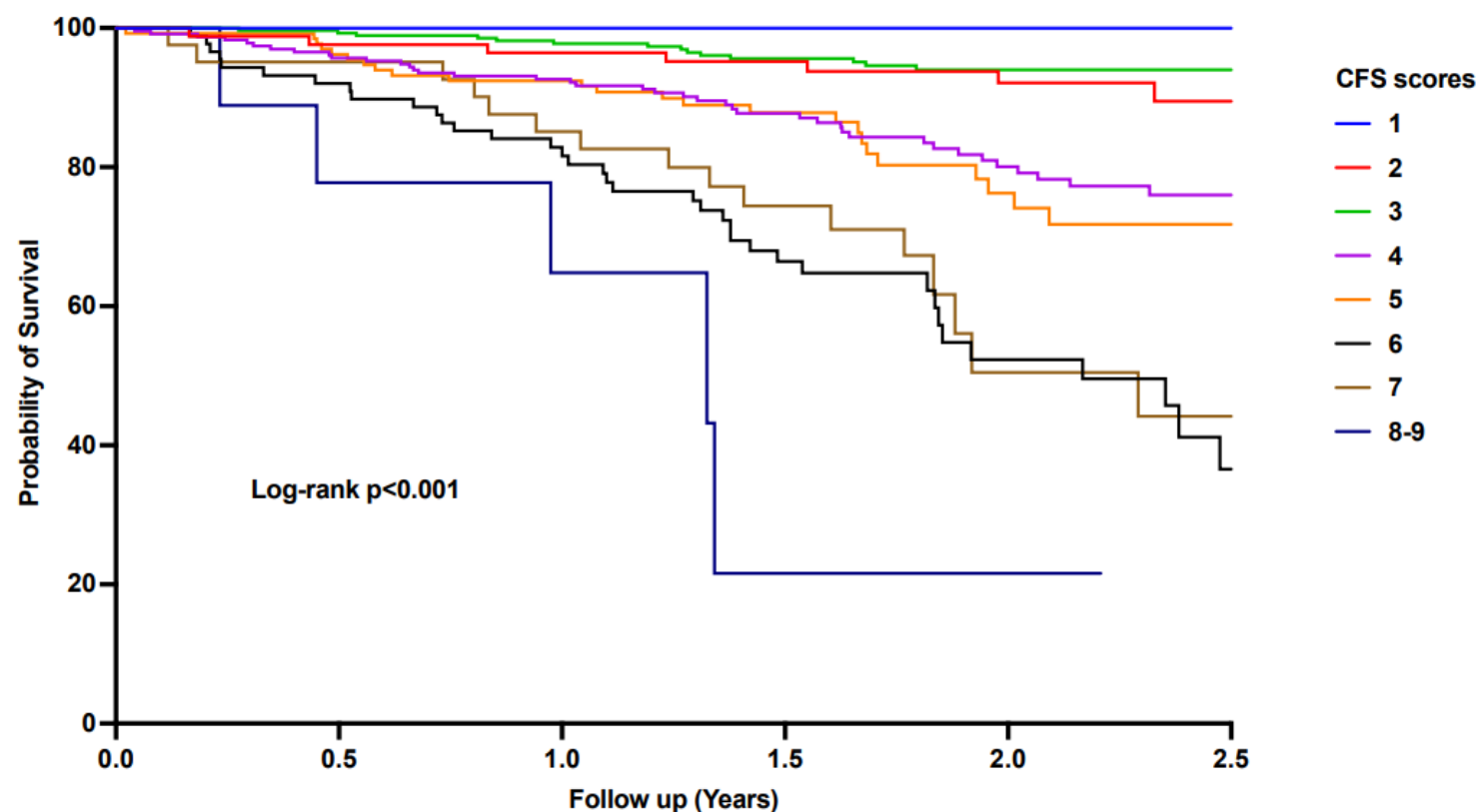
- To evaluate the prevalence, clinical determinants, and prognostic significance of frailty in a large cohort of patients with ATTR-CA.
- Frailty was assessed in **880 patients with ATTR-CA** (median age 80 years [Q1-Q3: 75-84 years], 719 [81.7%] male) using the Clinical Frailty Scale (CFS).

TABLE 1 Clinical and Imaging Characteristics of Patients Diagnosed With ATTR-CM at CFS Assessment

57.1 %

	CFS 1-3 (n = 378, 43.0%)	CFS 4 or 5 (n = 364, 41.4%)	CFS 6 or 7 (n = 129, 14.7%)	CFS 8 or 9 (n = 9, 1.0%)	P Value
Demographics					
Age, y	78 (74-82)	82 (77-85)	83 (78-88)	87 (84-90)	<0.001
>80 y	130 (34.3)	200 (55.2)	74 (57.4)	9 (100.0)	<0.001

FIGURE 2 Survival Analysis of Patients With ATTR-CA by Clinical Frailty Status



Clinical Phenotype and Prognostic Significance of Frailty in Transthyretin Cardiac Amyloidosis



FIGURE 3 Survival Analysis of Patients With ATTR-CA by NAC Stage and CFS

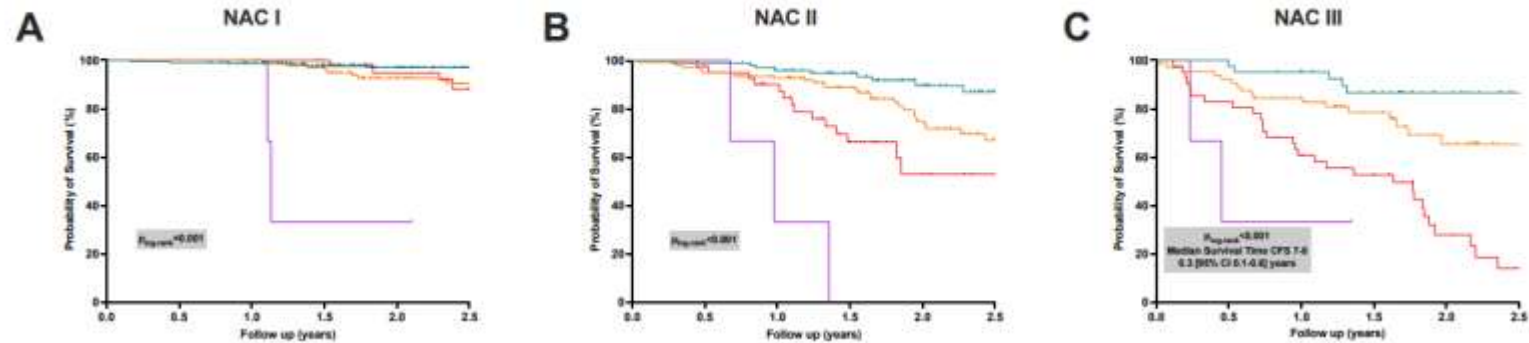
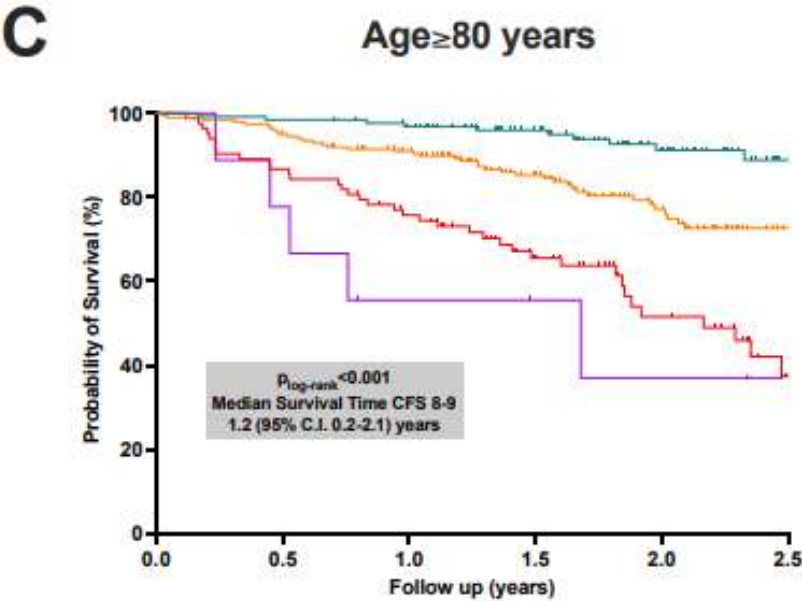


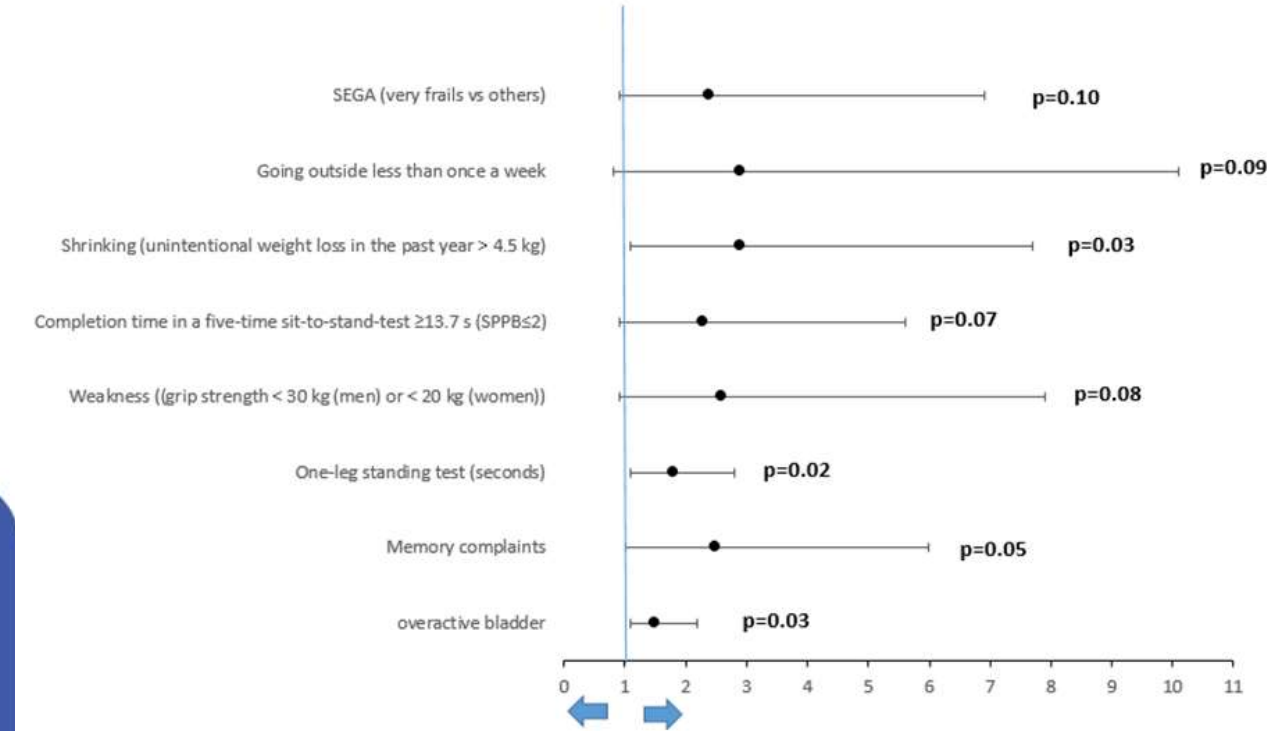
TABLE 3 Univariable and Multivariable Cox Regression Analysis to Determine Factors Associated With All-Cause Mortality

	Univariable			Multivariable		
	HR	95% CI	P value	HR	95% CI	P value
Age at evaluation (Δ year)	1.102	1.071-1.134	<0.001	1.029	0.998-1.061	0.063
Men	1.244	0.728-2.125	0.41			
NYHA functional class (III/IV)	3.162	2.226-4.493	<0.001	1.501	1.038-2.171	0.031
CFS (vs 1-3)			<0.001			<0.001
4 or 5	3.125	2.085-4.971	<0.001	2.941	1.774-4.867	<0.001
6 or 7	4.799	2.666-8.348	<0.001	4.123	2.423-7.015	<0.001
8 or 9	8.038	2.761-19.719	<0.001	9.716	3.340-28.266	<0.001
Log NT-proBNP	2.121	1.428-2.054	<0.001	1.897	1.512-2.379	<0.001
Log eGFR	0.491	0.301-0.894	0.015	0.533	0.311-0.915	0.022
Ischemic heart disease ^a	1.428	0.966-2.110	0.07	1.385	0.932-2.056	0.11
Diabetes mellitus ^a	1.404	0.946-2.082	0.09	1.067	0.719-1.592	0.84
Hypertension ^a	1.061	0.761-1.479	0.73			
Atrial fibrillation	1.330	0.951-1.860	0.09	0.815	0.578-1.152	0.25
Stroke/TIA ^a	1.134	0.653-1.970	0.66			
LV wall thickness (Δ mm)	1.071	1.007-1.138	0.029	1.052	0.966-1.099	0.36
LVEF (Δ %)	0.973	0.958-0.988	0.001	0.998	0.986-1.014	0.81
Loop diuretics ^a	1.381	0.980-1.946	0.07	1.050	0.734-1.509	0.78

The model was performed in 861 individuals. ^aAt the time of assessment. Abbreviations as in Table 1.

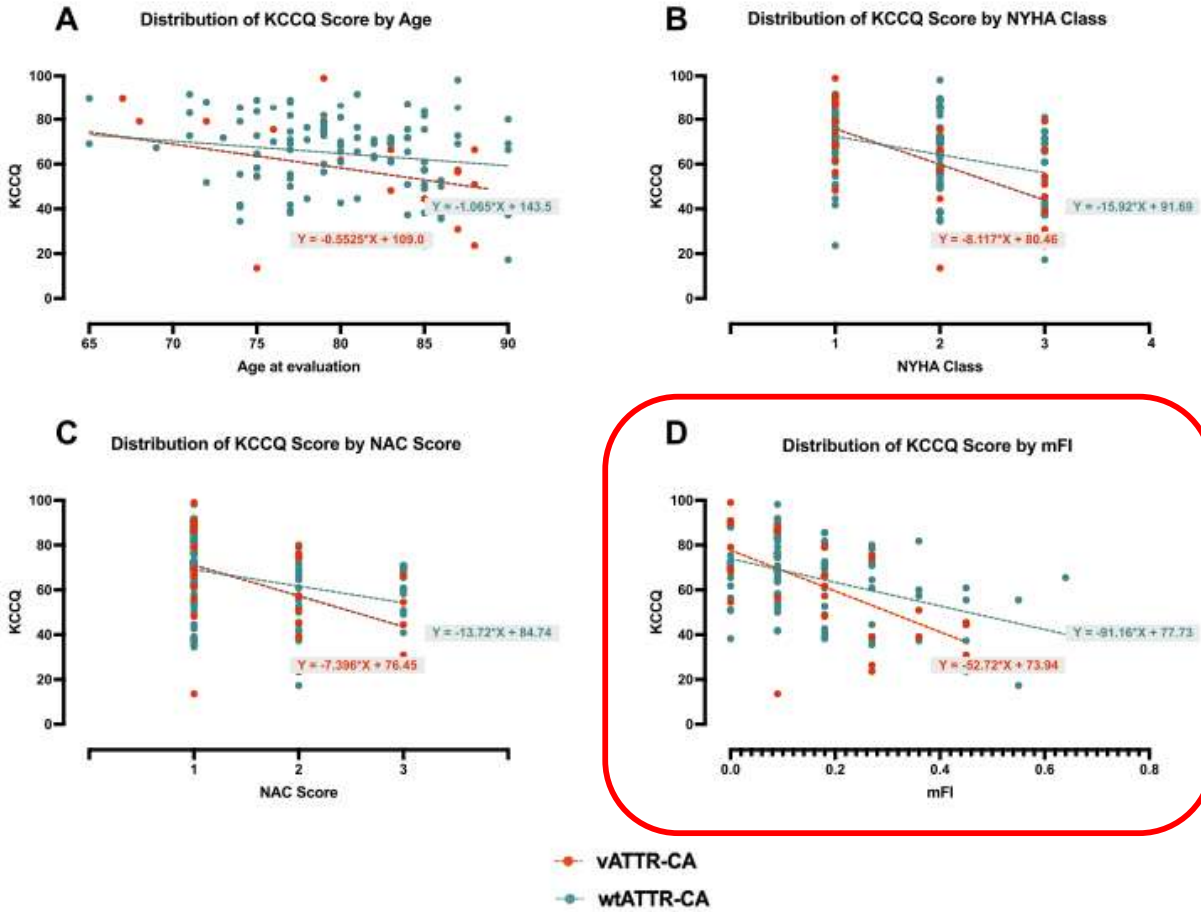


Frailty in heart failure according to the presence or absence of wild-type transthyretin cardiac amyloidosis



Un phénotype particulier

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EXPERT PANEL

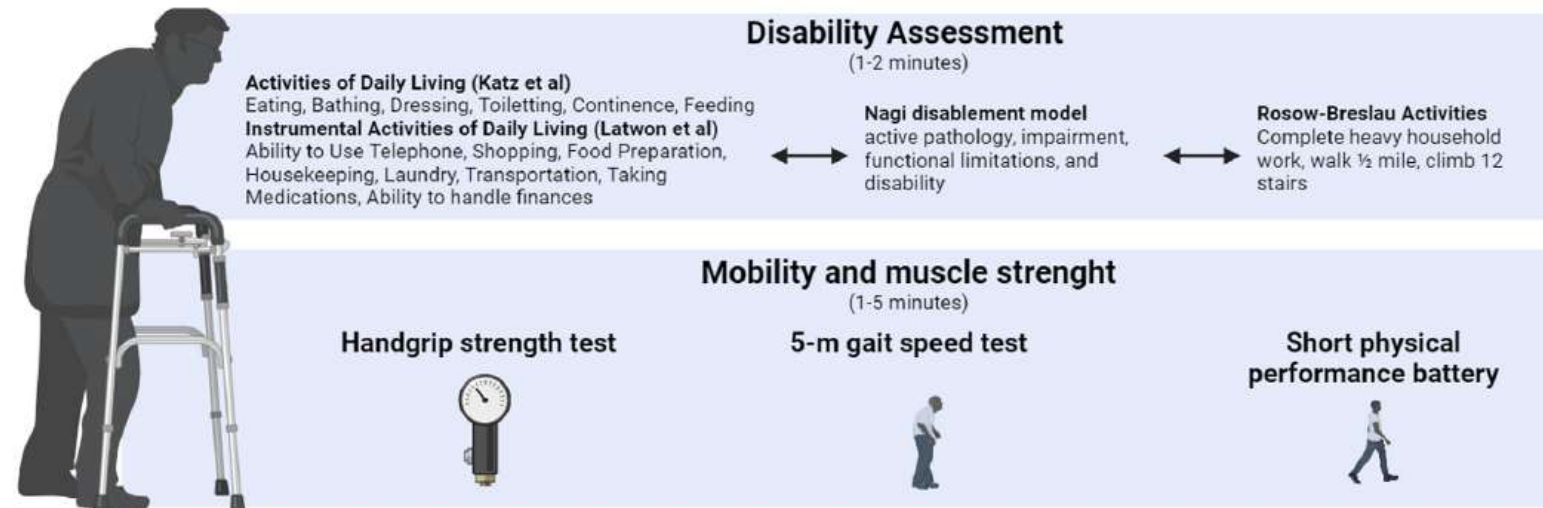
Comprehensive Geriatric Assessment to Optimize the Management of Older Patients With Transthyretin Cardiac Amyloidosis



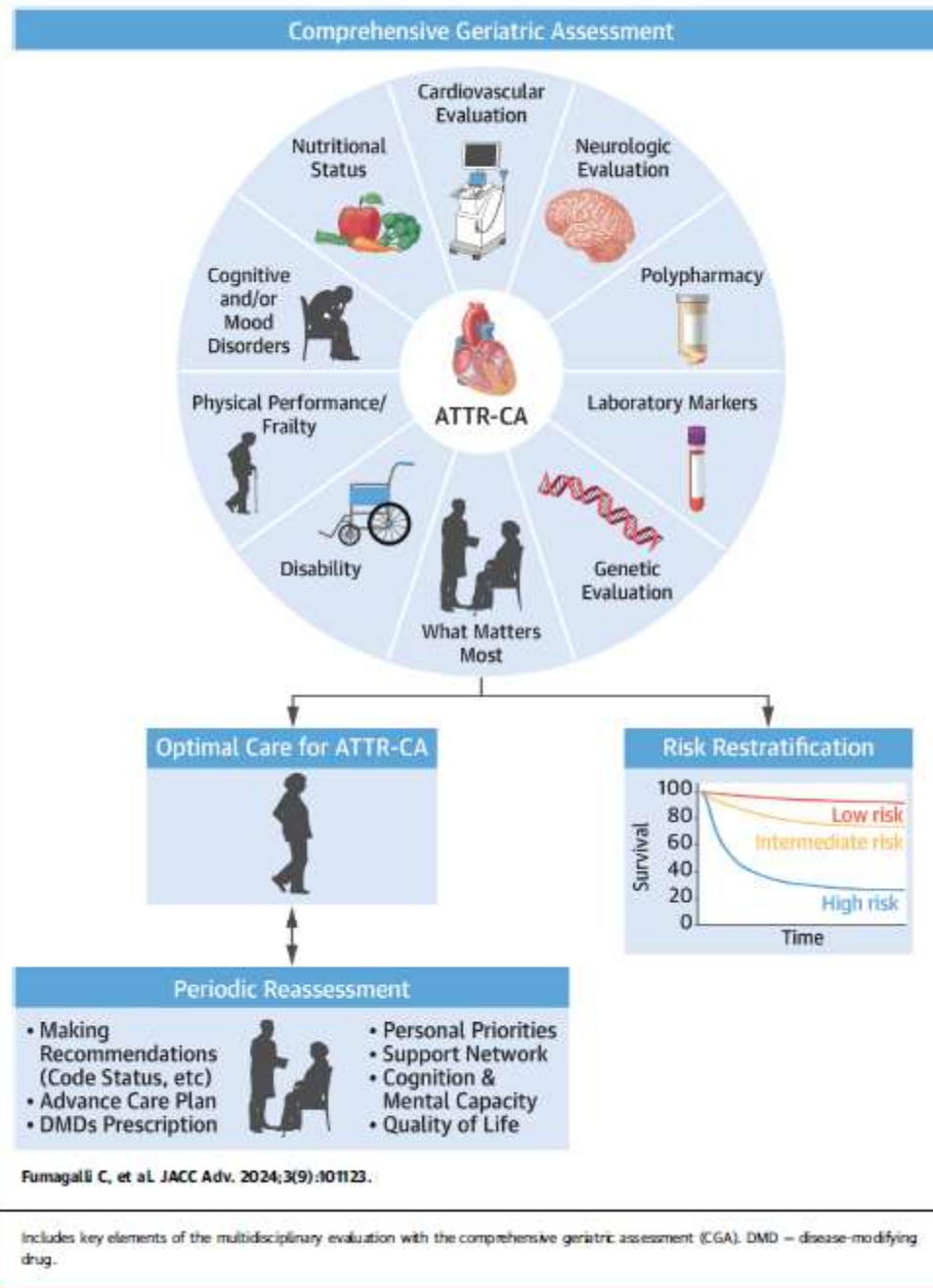
HIGHLIGHTS

- Patients with ATTR-CA are almost exclusively older adults at diagnosis with multiple chronic conditions.
- A routine CGA is useful to delineate the clinical complexity (ie geriatric syndromes) of older ATTR-CA patients.
- A CGA that incorporates the expertise of geriatricians, cardiologists, neurologists, palliative care specialists, and others may help reduce ageism and futility and could be integrated in future clinical trials.

FIGURE 1 Functional and Disability Assessment in Older Patients Diagnosed With ATTR-CA



The figure illustrates the components of functional and disability assessment for older patients diagnosed with transthyretin cardiac amyloidosis (ATTR-CA). The assessment is divided into 2 main categories: disability assessment and physical performance. Created with BioRender.com.



Cardiac Amyloidosis in Older Adults With a Focus on Frailty

JACC: Advances Expert Consensus

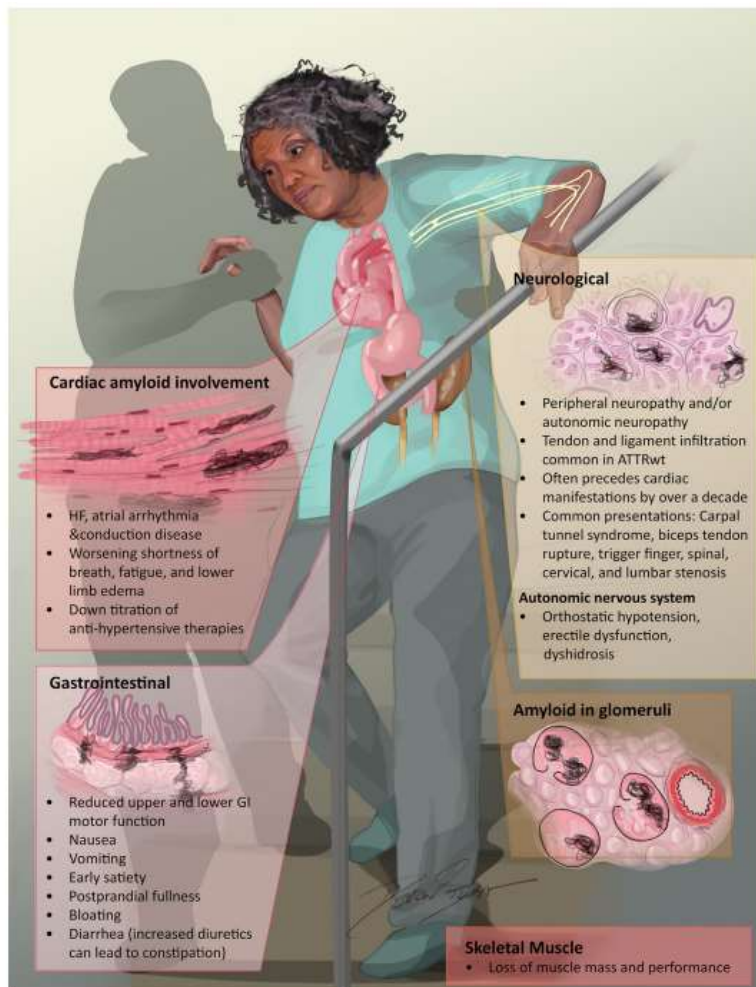
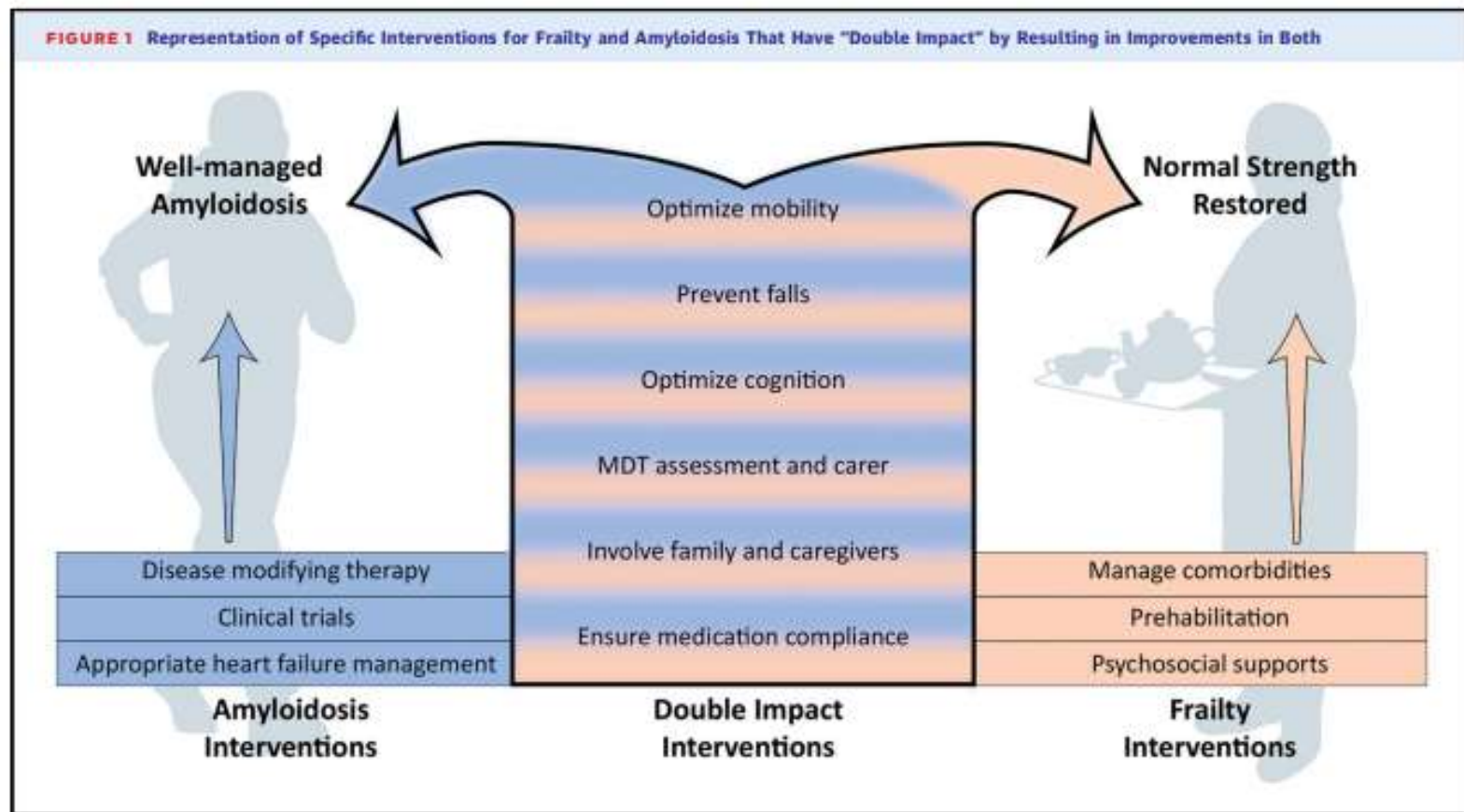


FIGURE 1 Representation of Specific Interventions for Frailty and Amyloidosis That Have “Double Impact” by Resulting in Improvements in Both



Take home messages

- Une prévalence significative dans l'IC du sujet âgé
- Une explosion thérapeutique avec différentes voies, différentes molécules
- Des données de vraie vie chez le sujet âgé
- Place grandissante de l'EGA chez ces patients : aide à la décision thérapeutique, management des comorbidités / fragilités / Syndromes gériatriques

Merci de votre attention

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