46° Convegno Nazionale
di Studi di Medicina Trasfusionale
Rimini, 13-15 maggio 2026

Nuove indicazioni in aferesi terapeutica

Angelo Ostuni
Direttore UO Medicina Trasfusionale AOU Policlinico Bari
Presidente SIdEM

disclosure

Il sottoscritto, in qualità di Relatore dichiara che
nell'esercizio della Sua funzione e per l'evento in oggetto, negli ultimi due anni ha avuto rapporti con soggetti portatori di interessi commerciali e che gli stessi NON SONO tali da permettere a tali soggetti di influenzare le sue funzioni al fine di trarne vantaggio:

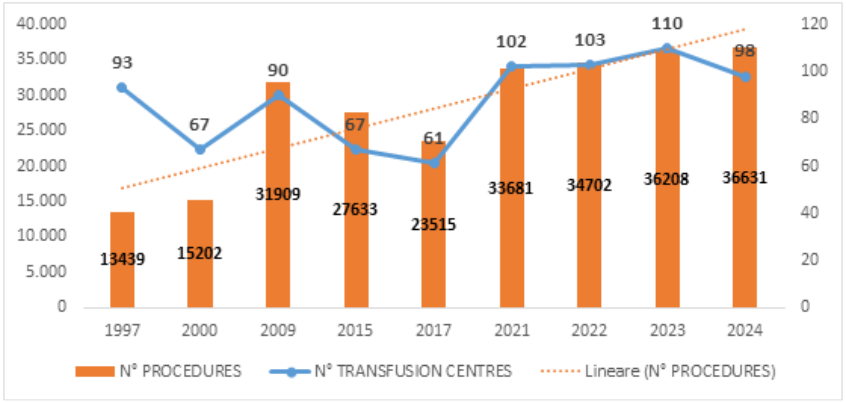
- Fresenius Kabi
- Therakos
- Vertex
- Kite Gilead

Guidelines on the Use of Therapeutic Apheresis in Clinical Practice– Evidence-Based Approach from the Writing Committee of the American Society for Apheresis: The Ninth Special Issue - *Laura Connelly-Smith, Nancy M. Dunbar et al. J Clin Apher. 2023*

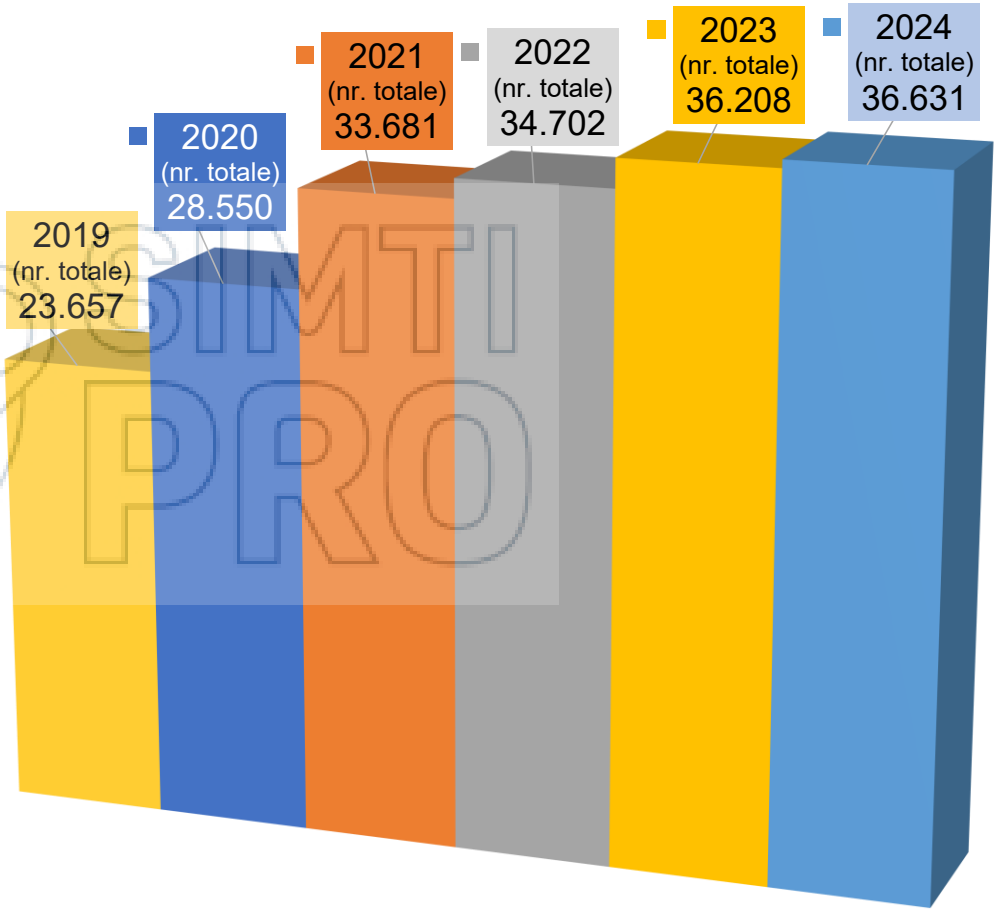
Adsorptive cytapheresis
ß2-microglobulin adsorption
Double filtration plasmapheresisa DFPP
Erythrocytapheresis
Extracorporeal liver support systems artificial liver support systems
Extracorporeal photopheresis ECP
Hemoperfusion
Immunoadsorption IA
Leukocytapheresis
Lipoprotein apheresis LA
Red blood cell exchange RBC Exchange
Therapeutic plasma exchange TPE
Thrombocytapheresis
Stem cell / Lymphocyte collection (Peripheral Blood Stem Cell) autologous and allogeneic

Transfusion and Apheresis Science 65 (2026) 104423
Italian register of therapeutic apheresis: 30 years of activity

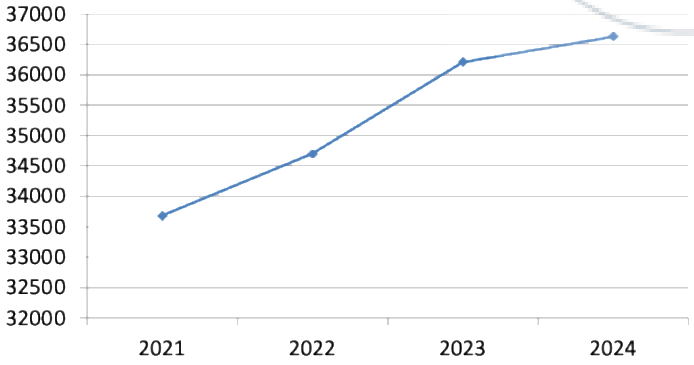
Number transfusion centers and therapeutic apheresis procedures from 1997 to 2024

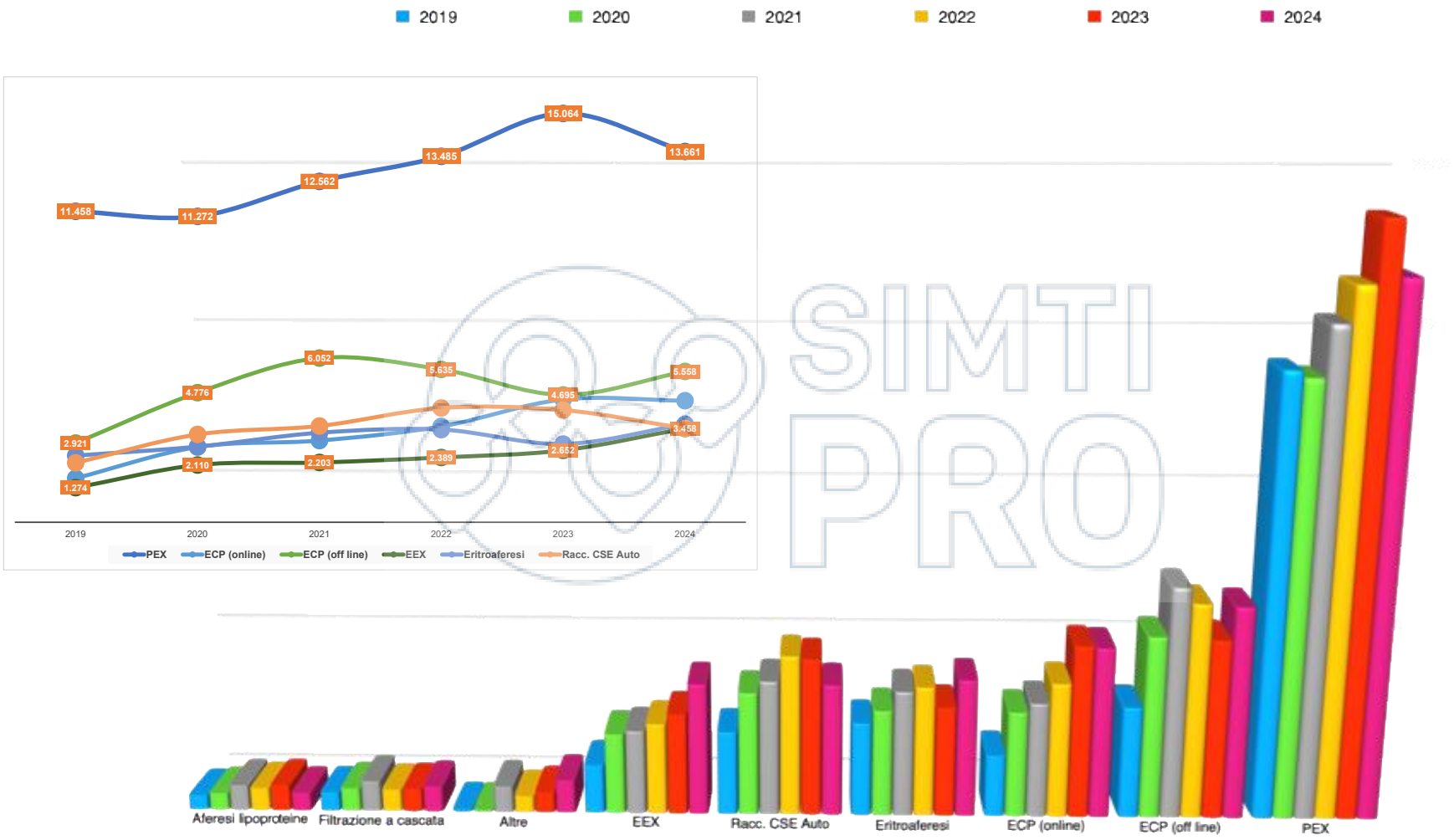


Total therapeutic apheresis procedures in Italy from 2019 to 2024 (SISTRA)



Procedure




2019
2020
2021
2022
2023
2024
11.458
11.272
12.562
13.485
15.064
13.661
2.921
4.776
6.052
5.635
4.695
5.558
1.274
2.110
2.203
2.389
2.652
3.458
PEX
ECP (online)
ECP (off line)
EEX
Eritroaferesi
Racc. CSE Auto
Aferesi lipoproteine
Filtrazione a cascata
Altre
EEX
Racc. CSE Auto
Eritroaferesi
ECP (online)
ECP (off line)
PEX

MULTIDISCIPLINARIETÀ

Aree a maggiore crescita:

- Neurologia
- Ematologia
- Terapia intensiva
- Trapianto e immunomodulazione
- Malattie rare immunologiche

Evoluzione della Medicina Trasfusionale
… *organizzazione hub & spoke* …

Sangue ed emocomponenti
Supporto trasfusionale
Emovigilanza

CAR-T e ATMP
Medicina personalizzata
Cell Therapy Platform
Therapeutic Apheresis

Linfocitoaferesi
Raccolta MNC
Processing
Chian of identity

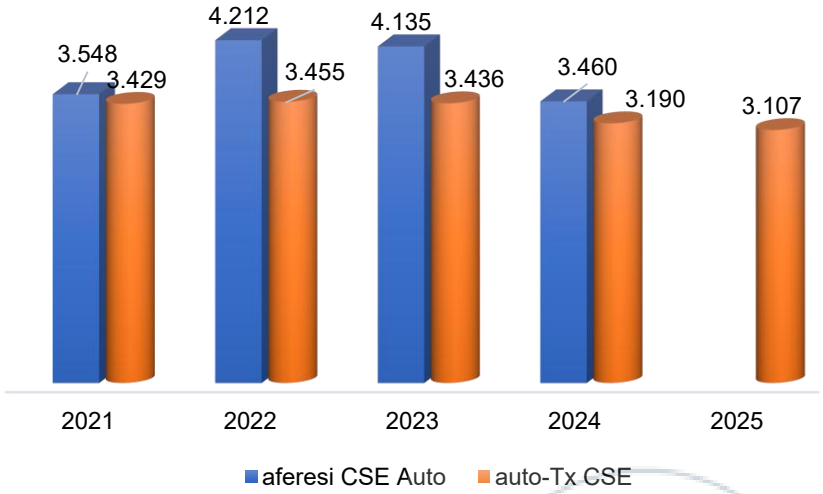
impatto sul Sistema Trasfusionale

Ad oggi:

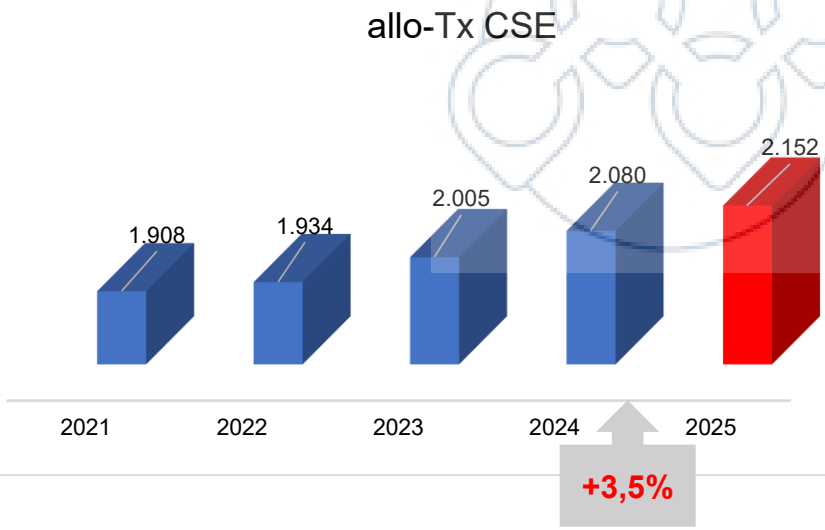
le verifiche e le simulazioni hanno comportato un ulteriore carico amministrativo (burocratico) →

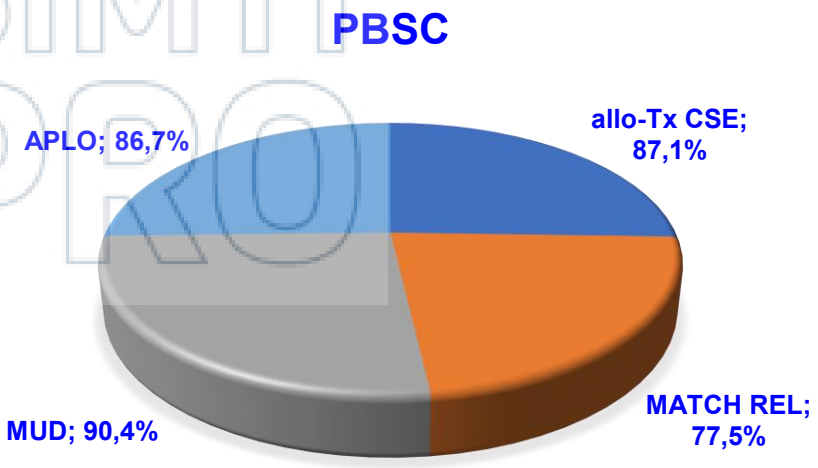
- ❑ *attività spesso ripetitive o ridondanti*
- ❑ *sovrapposizione tra i requisiti JACIE e quelli del titolare dell'autorizzazione all'immissione in commercio*

1. Autorizzazione regionale
2. Requisiti minimi AIFA/CTS CAR-T + G.Therapy
3. Certificazione CNT
4. Accreditamento JACIE
5. Terapia intensiva
6. Team multidisciplinare
7. Percorso paziente
8. Registro AIFA
9. Rete hub/spoke
10. Farmacia ospedaliera
11. Chain of identity / custody
12. Aferesi e raccolta cellulare
13. Processazione/crioconservazione
14. Trasporto biologico/farmaco
15. Gestione tossicità
16. Formazione personale
17. Farmacovigilanza
18. Qualità/GMP-GCP
19. Consenso informato
20. Comitato etico/sperimentazioni
21. Hospital exemption / uso non ripetitivo
22. Indicatori e governance

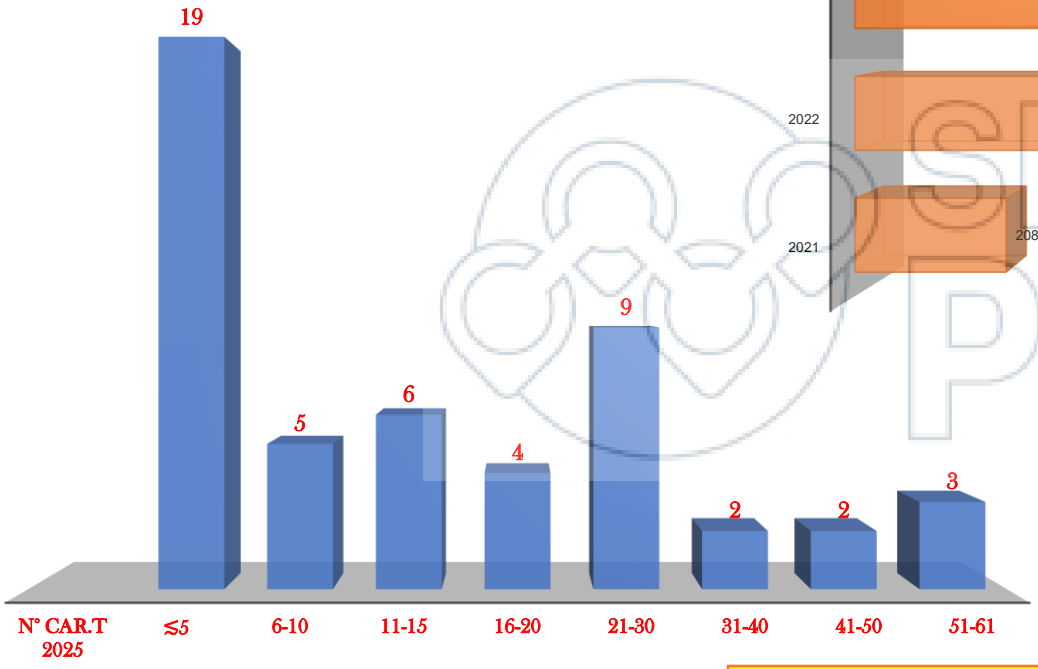


Δ '23 - '25	Δ '24 - '25	PBSC	età pazienti
-9,6%	-2,6%	99,6%	40,5% 41-60aa 40,7% 60-70aa

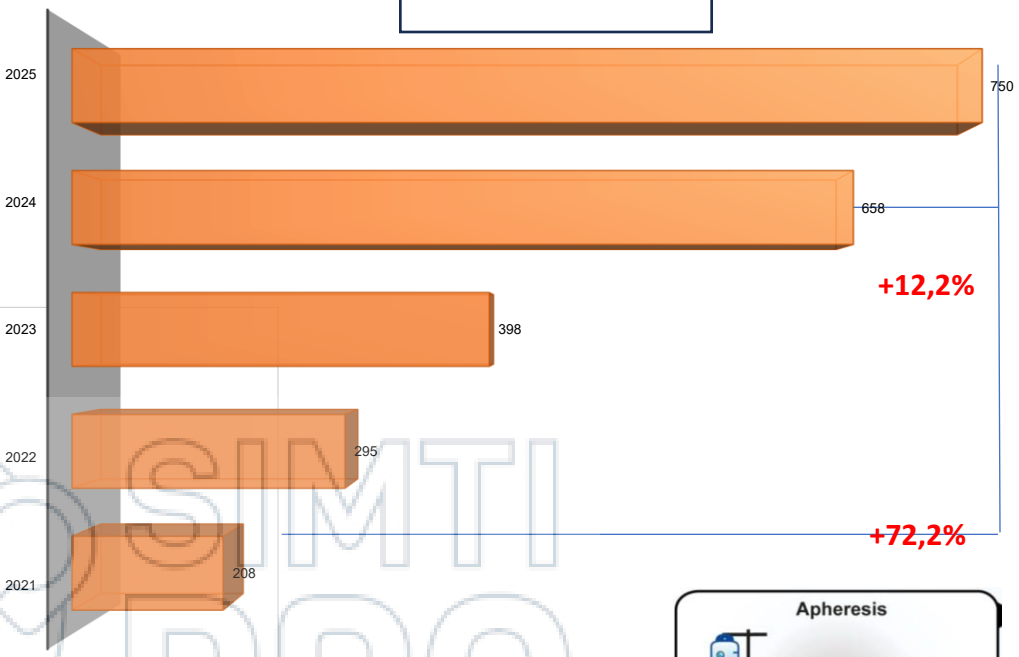


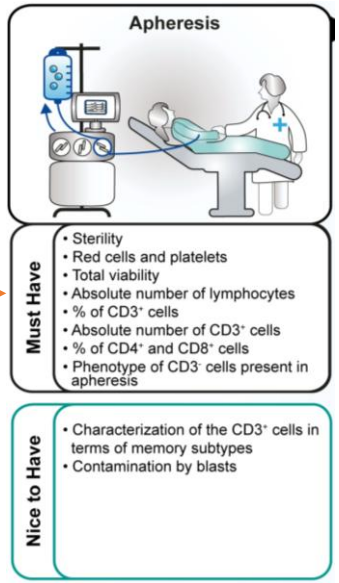


50 centri CAR.T
37 unità Aferesi + Laboratorio manipolazione



CAR.T



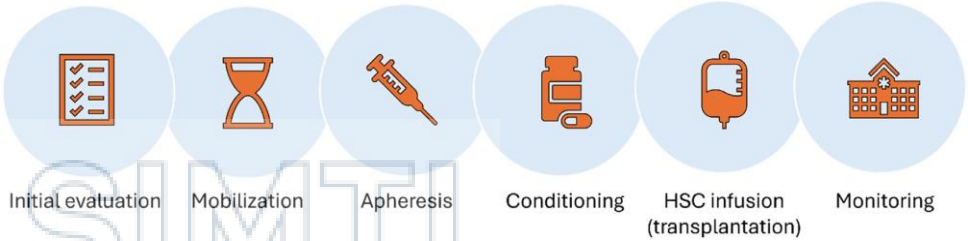


TIMING → OUTCOME
VEIN to VEIN
BRAIN to VEIN

Exagamglogene Autotemcel for Transfusion-Dependent β-Thalassemia

F. Locatelli, P. Lang, D. Wall, R. Meisel, S. Corbacioglu, A.M. Li, J. de la Fuente, A.J. Shah, B. Carpenter, J.L. Kwiatkowski, M. Mapara, R.I. Liem, M.D. Cappellini, M. Algeri, A. Kattamis, S. Sheth, S. Grupp, R. Handgretinger, P. Kohli, D. Shi, L. Ross, Y. Bobruff, C. Simard, L. Zhang, P.K. Morrow, W.E. Hobbs, and H. Frangoul, for the CLIMB THAL-111 Study Group*

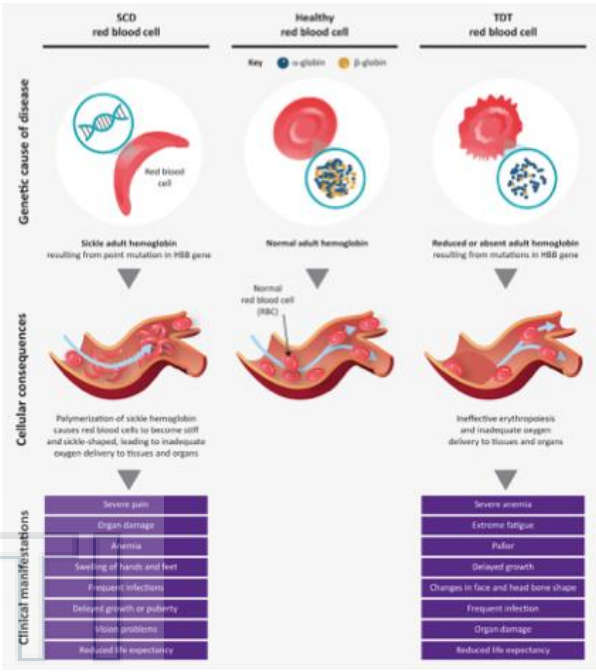
… **EXA-CEL** utilizza la tecnologia di editing genomico CRISPR-Cas9 per riattivare l'HbF mediante la modifica di sequenze di DNA di una regione specifica dei precursori eritrodi (BCL11A) utilizzando le cellule CD34+ autologhe (HSPCs)



Settembre 2025: AIFA autorizza «***EXA**gamglogene autotem**CEL***»
al 30 aprile 2026: **6 CENTRI QUALIFICATI E AUTORIZZATI**
AFERESI (CD34) IN ~ 15 PAZIENTI

Best Practices in Gene Therapy for Sickle Cell Disease and Transfusion-dependent β-Thalassemia

Haydar Frangoul et al.,
Transplantation and Cellular Therapy (2025)



TdT & SCD - Target raccolta = > 20x10⁶/kg ricevente

raccolta autologa

[Eleggibilità]

Valutazione

Pre-Mobilizzazione

ERITROEXCHANGE Sickle Cell Disease
SUPPORTO TRASFUSIONALE
GESTIONE TERAPIA FARMACOLOGICA

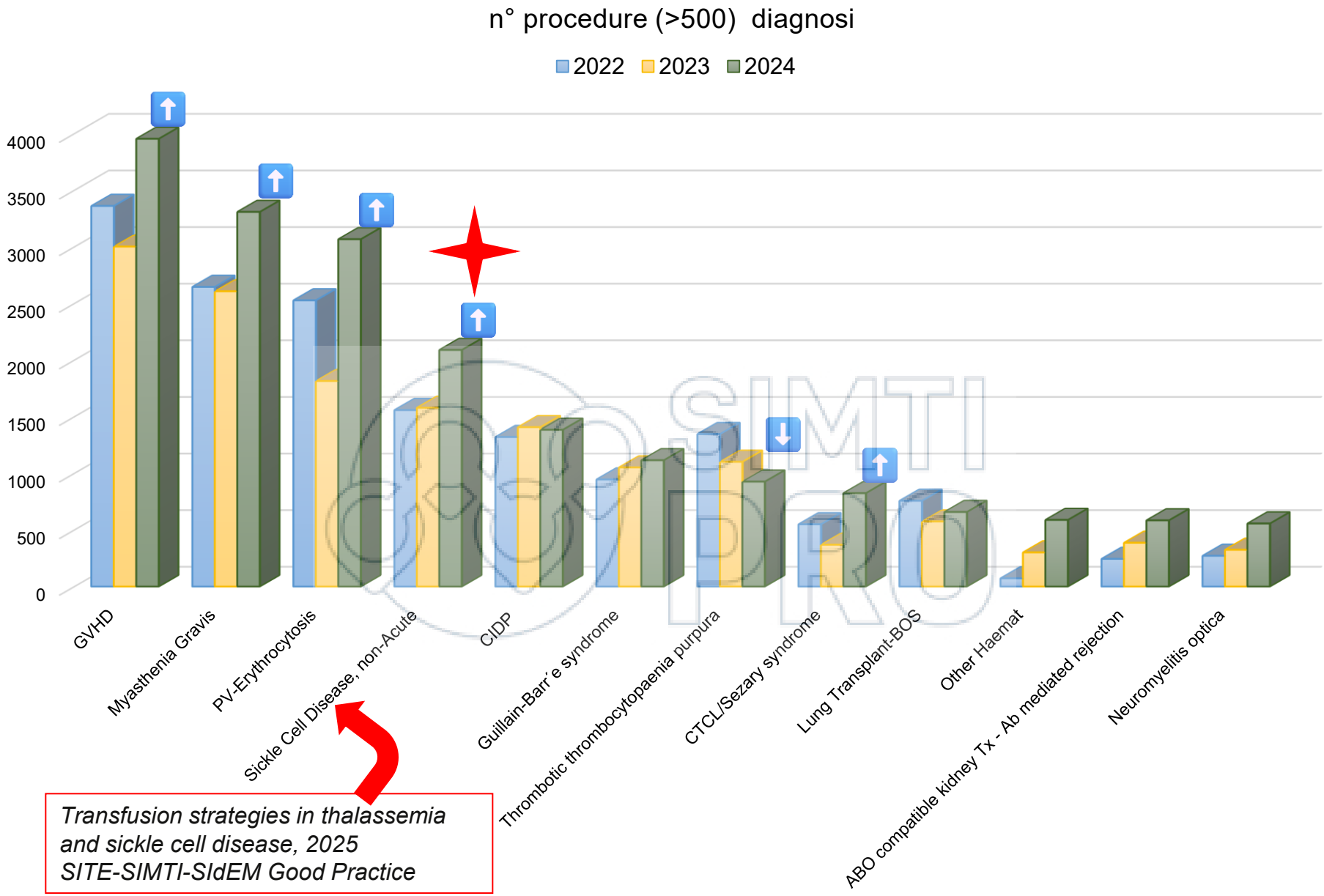
Mobilizzazione =

GCSF+PLX (TdT) - PLX (SCD)

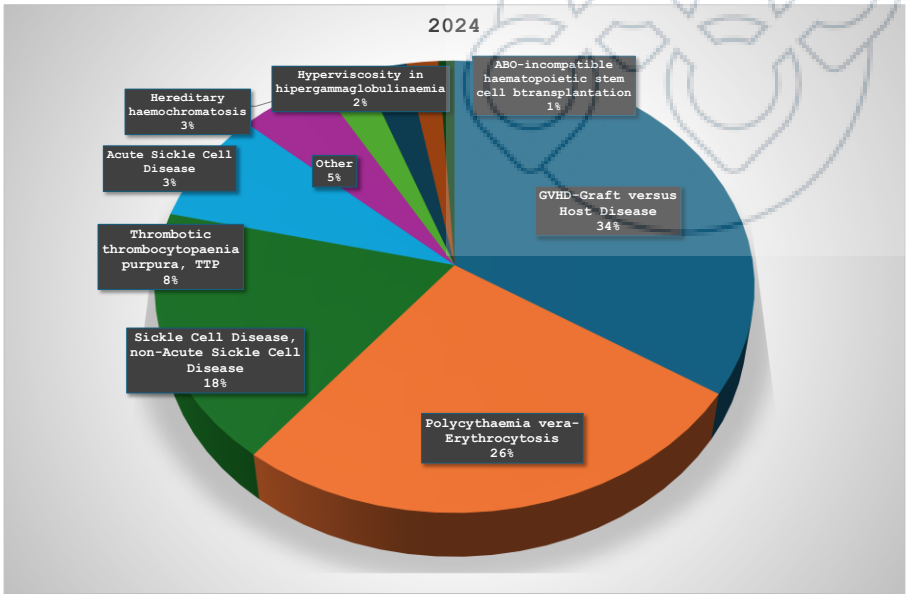
1 «ciclo di mobilizzazione» = 3 raccolte consecutive

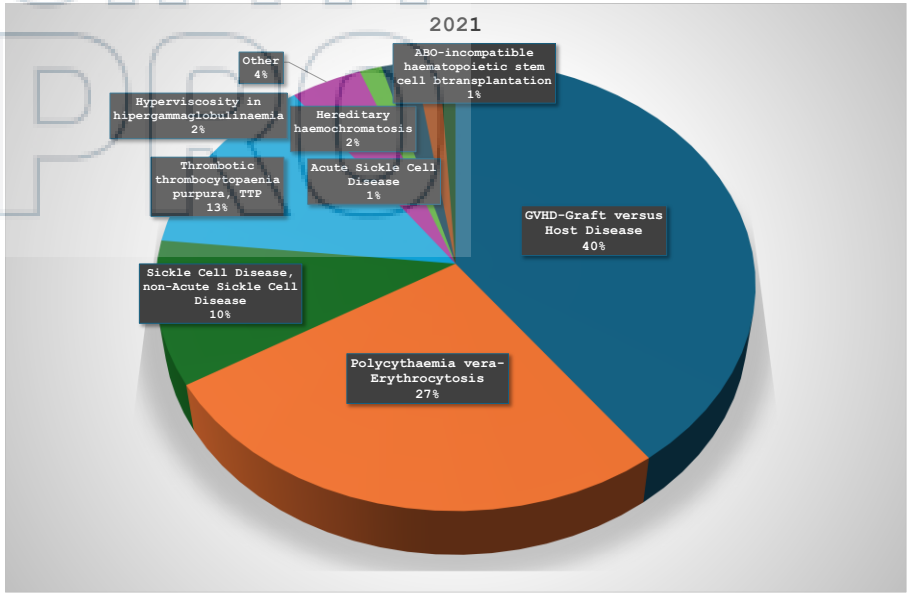
1a + 2a raccolta = obiettivo raggiungimento target >20x10⁶

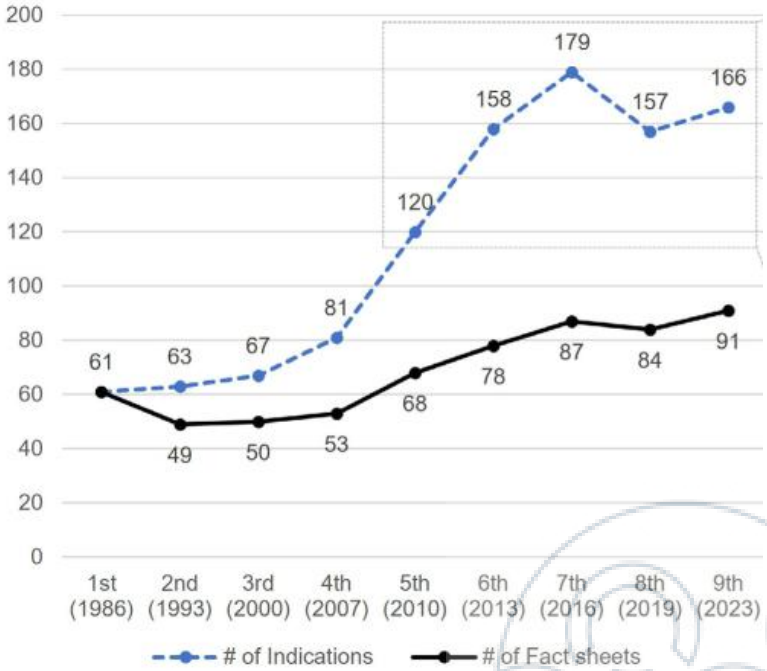
3a raccolta CD34 backup


n° procedure (>500) diagnosi
2022
2023
2024
4000
3500
3000
2500
2000
1500
1000
500
0
GVHD
Myasthenia Gravis
PV-Erythrocytosis
Sickle Cell Disease, non-Acute
CIDP
Guillain-Barr e syndrome
Thrombotic thrombocytopaenia purpura
CTCL/Sezary syndrome
Lung Transplant-BOS
Other Haemat
ABO compatible kidney Tx - Ab mediated rejection
Neuromyelitis optica
Transfusion strategies in thalassemia and sickle cell disease, 2025
SITE-SIMTI-SIdEM Good Practice

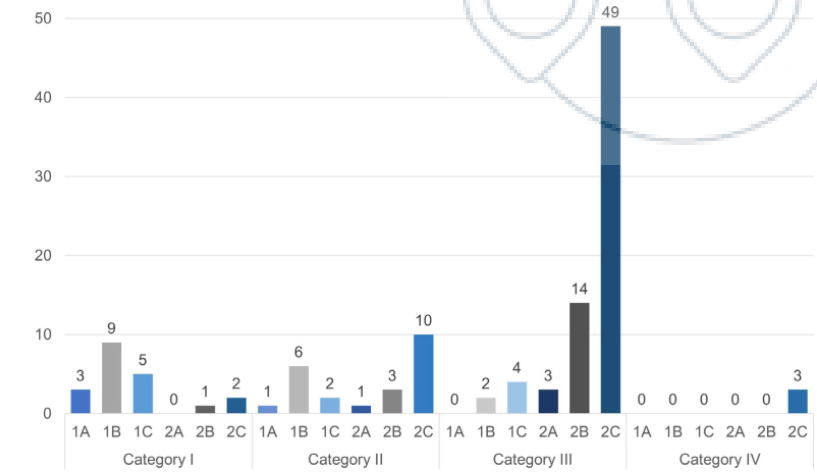
Number of procedures for clinical indications from 2019 to 2024 in SISTRA	2019	2020	2021	2022	2023	2024
NEUROLOGY	6.115	5.953	6.151	6.991	7.281	7.974
HEMATOLOGY	6.370	8.996	11.562	10.860	9.612	11.908
RHEUMATOLOGY	1.397	1.200	1.190	871	884	864
NEPHROLOGY	328	396	698	656	653	618
DERMATHOLOGY	524	986	1.108	793	535	1.024
ENDOCRINOLOGY	49	8	9	15	12	6
GASTROENTEROLOGY	366	249	237	307	165	125
METABOLISM	571	475	731	774	871	692
SOLID ORGAN TRANSPLANT	1.162	1.611	2.380	1.979	1.898	2.318
OTHER	30	69	45	67	32	57







	2010 (5th)	2013 (6th)	2016 (7th)	2019 (8th)	2023 (9th)
ANCA-associated RPGN, DAH	1B	1C			
Anti-glomerular basement membrane disease, Dialysis dependence, no DAH	1A	2B			
Anti-glomerular basement membrane disease, Dialysis independence	1A	1B	1C	1B	
Atopic dermatitis, recalcitrant			2C	2B	
Chronic acquired demyelinating polyneuropathies, IgM		1C		1B	
Cryoglobulinemia, Severe/symptomatic	1B	2A			
Familial hypercholesterolemia, All patients		1C		1B	
Focal segmental glomerulosclerosis, Recurrent in kidney transplant	1C	1B			
Hypertriglyceridemic pancreatitis, Severe		2C		1C	
Immune thrombocytopenia, Refractory	1C	2C			
Multiple sclerosis, Acute attack/relapse		1B		1A	
Neuromyelitis optical spectrum disorder, Acute attack/relapse	1C	1B			
Neuromyelitis optical spectrum disorder, Maintenance	1C	2C			
Pediatric autoimmune neuropsychiatric disorders, Sydenham's chorea, severe	1B	2B			
Pemphigus vulgaris, Severe	2B	2C	2B		
Psoriasis	1B	2C			
Sepsis with multiorgan failure	2B			2A	
Sudden sensorineural hearing loss	2C			2A	
Thrombotic microangiopathy, drug induced, Quinine	2B	2C			
Thrombotic microangiopathy, drug induced, Ticlopidine	2B	1B	2B		
Transplantation, heart, Desensitization		2C	1C		
Transplantation, liver, Desensitization, ABOi, living donor	2C	1C			
Vasculitis, ANCA associated, Eosinophilic granulomatosis with polyangiitis			1B	2C	
Voltage-gated potassium channel antibody-related diseases		1C	2C	1B	
Color index 2C	2B	2A	1C	1B	1A



Category and grade distribution of therapeutic plasma exchange indications in the ninth edition.

Trends in category and grade for therapeutic plasma exchange in the latest guideline on therapeutic apheresis by the ASFA: Hurdles in pursuing evidence-based medicine

Vox Sanguinis. 2024

Han Joo Kim, Dae-Hyun Ko et al.

When Strong Recommendations Rest on Weak Evidence: Lessons From Therapeutic Apheresis Guidelines

Journal of Clinical Apheresis, 2026; 41:e70098 https://doi.org/10.1002/jca.70098

Jeremy W. Jacobs, Yara A. Park, Garrett S. Booth, Brian D. Adkins, Joseph Yossi Schwartz, Evan M. Bloch, Victoria Costa, Sheharyar Raza

Condition (ASFA fact- sheet)	Indication (clinical context)	Category	Grade	Standard procedure	Evidence snapshot
Anti- glomerular basement membrane disease	Diffuse alveolar hemorrhage	I	1C	TPE	~200 pts., 1 small RCT
Wilson disease, fulminant	Bridge to liver transplant	I	1C	TPE	< 100 pts., uncontrolled
Waldenström macroglobulinemia	Prophylactic TPE before rituximab	I	1C	TPE	< 50 pts., no trials
N- methyl-D-aspartate receptor encephalitis	Acute management	I	1C	TPE/IA	> 300 pts., observational
Sickle-cell disease, acute stroke	Emergency therapy	I	1C	RBC Exchange	~240 pts. across 10 series
Transplantation, liver	Desensitization, ABO incompatible, living donor	I	1C	TPE	< 200 pts., no RCTs
Transplantation, heart	Rejection prophylaxis (antibody- mediated)	II	1C	TPE	> 900 patients in non-randomized studies
Transplantation, heart	Desensitization	II	1C	TPE	
Transplantation, lung	Chronic lung allograft dysfunction	II	1C	ECP	> 200 patients in > 10 case series
Transplantation, lung	Bronchiolitis obliterans syndrome	II	1C	ECP	
Sickle-cell disease, acute	Acute chest syndrome (severe)	II	1C	RBC Exchange	> 320 patients: 2 non- randomized trials (n = 121) + > 10 case- series
Neuromyelitis- optica spectrum disorder	Acute attack/relapse	II	1C	IA	~140 patients: 1 non- randomized trial (n = 61) + 5 case- series and 17 case- report
Chronic acquired demyelinating polyneuropathy	Anti- myelin- associated glycoprotein	III	1C	TPE	Small case series
Secondary erythrocytosis	Symptomatic or high- risk	III	1C	Erythrocytapheresis	~500 cases in 8 series
Hypertriglyceridemic pancreatitis (severe)	Bridge to definitive care	III	1C	TPE/LA	> 300 patients across multiple non-randomized trials
Progressive multifocal leukoencephalopathy associated with natalizumab	Drug clearance	III	1C	TPE	~300 case reports
Pruritus due to hepatobiliary diseases	Treatment- resistant	III	1C	TPE	< 30 case reports

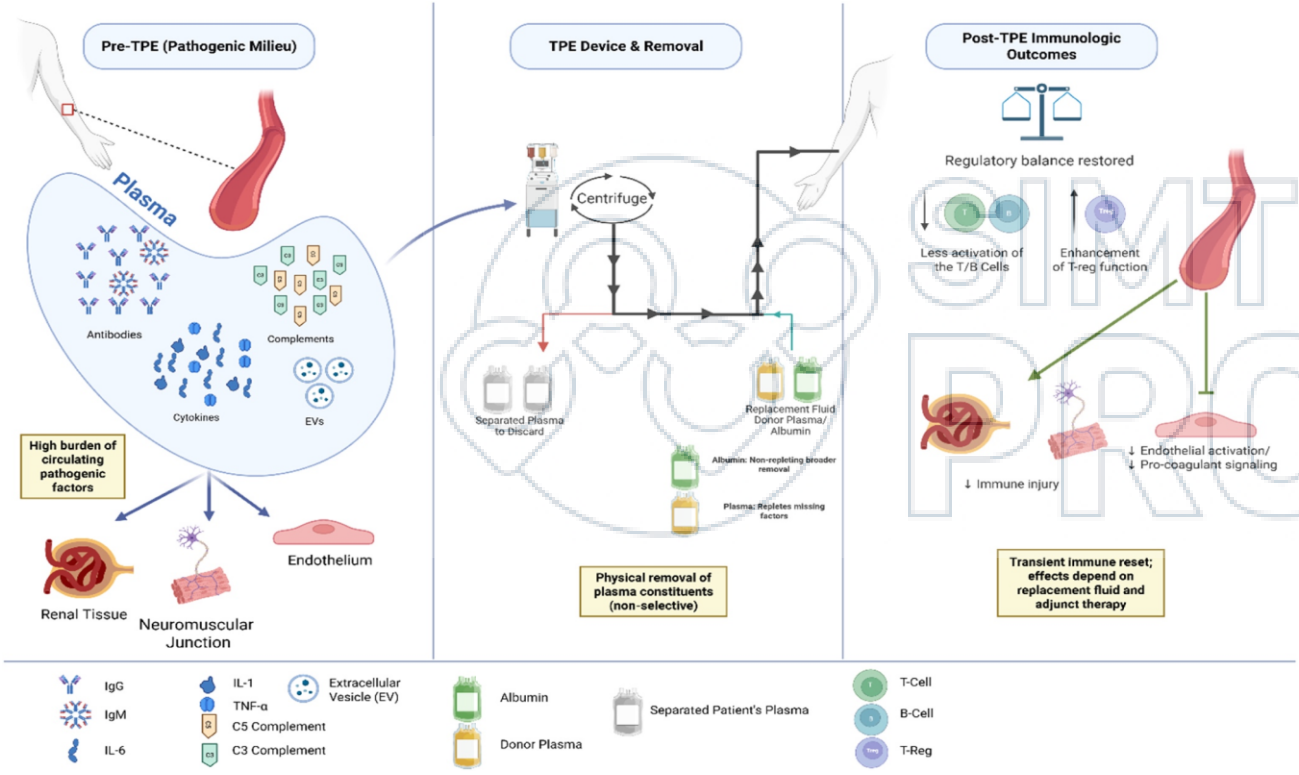
One-third (33.1%, 55/166) of the 166 indications in the 2023 ASFA guidelines have strong recommendations. However, almost a third (**30.9%**, 17/55) **of those strong recommendations are based on low- or very low- quality evidence**.

…**54.8%**, 91/166) **are informed low- or very- low- quality evidence**.

Mechanisms of immune modulation by therapeutic plasma exchange

Nicholas Parisi, Menatalla Nadim, Yamac Akgun - Transfusion and Apheresis Science 65 (2026)

- Immunoglobulin Levels
- Autoantibody Titers
- Complement and Coagulation Factors
- Cytokines and Inflammatory Markers
- Disease-Specific Biomarkers
- Impact on T-Cell Regulation and Immune Balance



…plasma exchange continues to exemplify how **biophysical removal of pathogenic plasma constituents** can effectively **restore immune balance and improve patient outcomes** in both acute and chronic immune-mediated diseases.

Neurological

Guillain-Barré syndrome, I
Myasthenia Gravis, I
TPE logic: removal of autoantibodies, immune complexes

Immunological

Systemic lupus erythematosus, II
Catastrophic antiphospholipid synd., I
TPE logic: removal of autoantibodies, immune complexes

Metabolic

Familial Hypercholesterolemia, I
Hypertriglyceridic Pancreatitis, III
TPE logic: lipid/inflammatory complex removal

Hematological/Vascular

Lipoprotein(a) hyperlipoproteinemia, II
peripheral vascular diseases, II
TPE logic: reduced oxidized LDL, lipoprotein(a), CRP, and fibrinogen

Renal

Goodpasture's syndrome, I
IgA nephropathy, III
TPE logic: autoantibody removal

Oncological

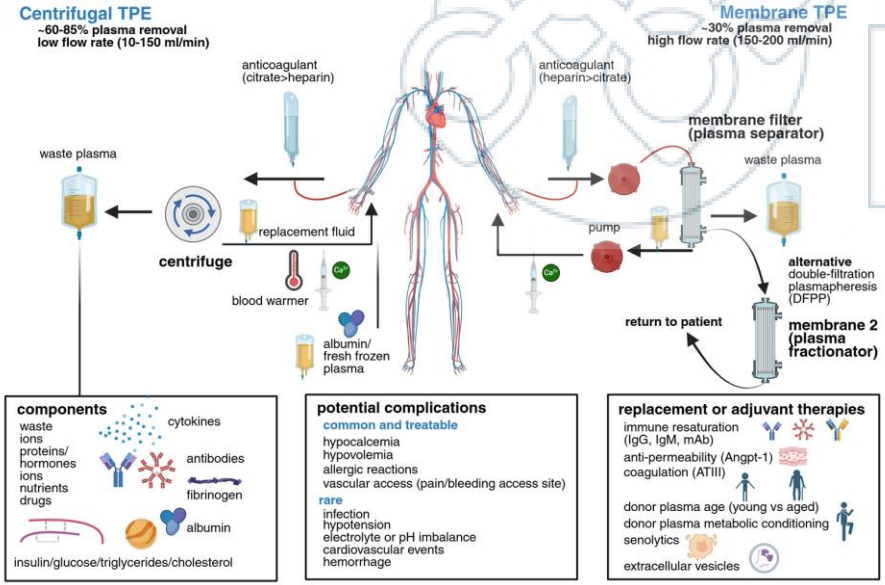
Cutaneous T-cell lymphoma, I
Myeloma cast nephropathy, II
TPE logic: ECP mediated apoptosis of malignant cells, autoantibody removal

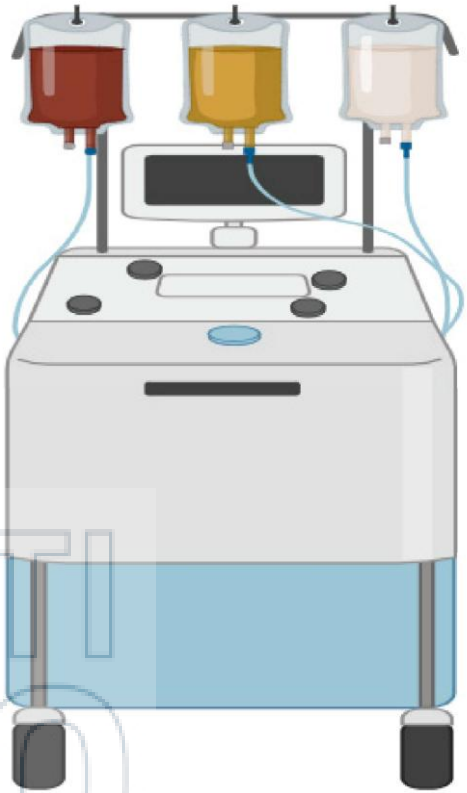
Toxins

Wilson's Disease (copper), I
Mushroom poison, II
TPE logic: toxin removal/ depletion

Organ Transplantation

kidney or liver transplants, I
lung or heart, II
TPE logic: immune desensitization, reduced antibody rejection





Therapeutic Plasma Exchange: Current and Emerging Applications to Mitigate Cellular Signaling in Disease

R. M. Imtiaz Karim Rony, Joshua D. Tompkins et al.
Biomolecules 2025

SGB, MG, CIDP	Neurodegenerative Disease	~~schizofrenia~~ ~~multifocal motor neuropathy~~

Disautonomia Autoimmune: condizioni eterogenee caratterizzate da disfunzione del sistema nervoso autonomo

- Gangliopatia autonomica autoimmune con Ab anti-acetilcolina (AchR)
- Sindrome da tachicardia posturale ortostatica (POTS): ipoperfusione cerebrale con risposte esagerate tipo «lotta o fuga» (*fight or flight*) in presenza di Ab AchR (10%)

Alzheimer: placche di amiloide beta, alterazione della barriera emato-encefalica e legame amiloide-albumina (studio AMBAR)

Malattie metaboliche: ipercolesterolemia familiare; pancreatite da ipertrigliceridemia
Insufficienza epatica acuta; Epatite autoimmune

Therapeutic Plasma Exchange: Current and Emerging Applications to Mitigate Cellular Signaling in Disease

R. M. Imtiaz Karim Rony, Joshua D. Tompkins et al. Biomolecules 2025

COMMON EMERGENCY INDICATIONS According to **ASFA guidelines** (Category I–II):

HEMATOLOGIC

- Thrombotic thrombocytopenic purpura (TTP)
- Atypical HUS
- Hyperviscosity syndrome
- Severe autoimmune hemolysis (selected cases)

NEUROLOGIC

- Myasthenic crisis
- Guillain–Barré syndrome (severe forms)

IMMUNOLOGIC / OTHER

- Catastrophic antiphospholipid syndrome
- Severe vasculitis with organ failure
- Acute antibody-mediated transplant rejection

TTP remains the true time-critical emergency.

Apheresis Team and Job Descriptions

N. Worel and A. Malmborg Kisch - I. Kozanoglu (ed.),
Problem Solving in Apheresis Medicine, https://doi.org/10.1007/978-3-031-74081-7_4

STAFFING REQUIREMENTS

- Emergency plasma exchange requires
- Physician trained in therapeutic apheresis
- Nurse trained in extracorporeal procedures
- On-call availability system
- Written competency documentation

Revolutionizing Apheresis: The Transformative Impact of Artificial Intelligence on Precision, Safety, and Clinical Outcome Outcomes

Ajit Pal Singh, Rahul Saxena, Suyash Saxena, Indian Journal of Pathology: Research and Practice, 2025

Category	Benefit	Description
Operational Efficiency	Workflow Optimization	Streamlines scheduling, resource allocation, and data entry through automation.
	Reduced Procedure Time	AI optimizes flow rates and volumes, reducing overall procedure duration.
Data Management & Insights	Predictive Analytics	Forecasts patient response trends, treatment needs, and resource demands.
	Enhanced Documentation	Automatically generates detailed and standardized procedural records.
Quality Control	Equipment Performance Monitoring	AI identifies calibration issues or mechanical faults proactively.
	Standardization Across Procedures	Ensures uniformity and adherence to best practices across different operators and centers.
Patient-Centric Outcomes	Improved Patient Safety and Comfort	Less invasive, faster, and more precisely controlled procedures.
	Higher Treatment Success Rates	Improved clinical decision-making leads to better therapeutic efficacy.

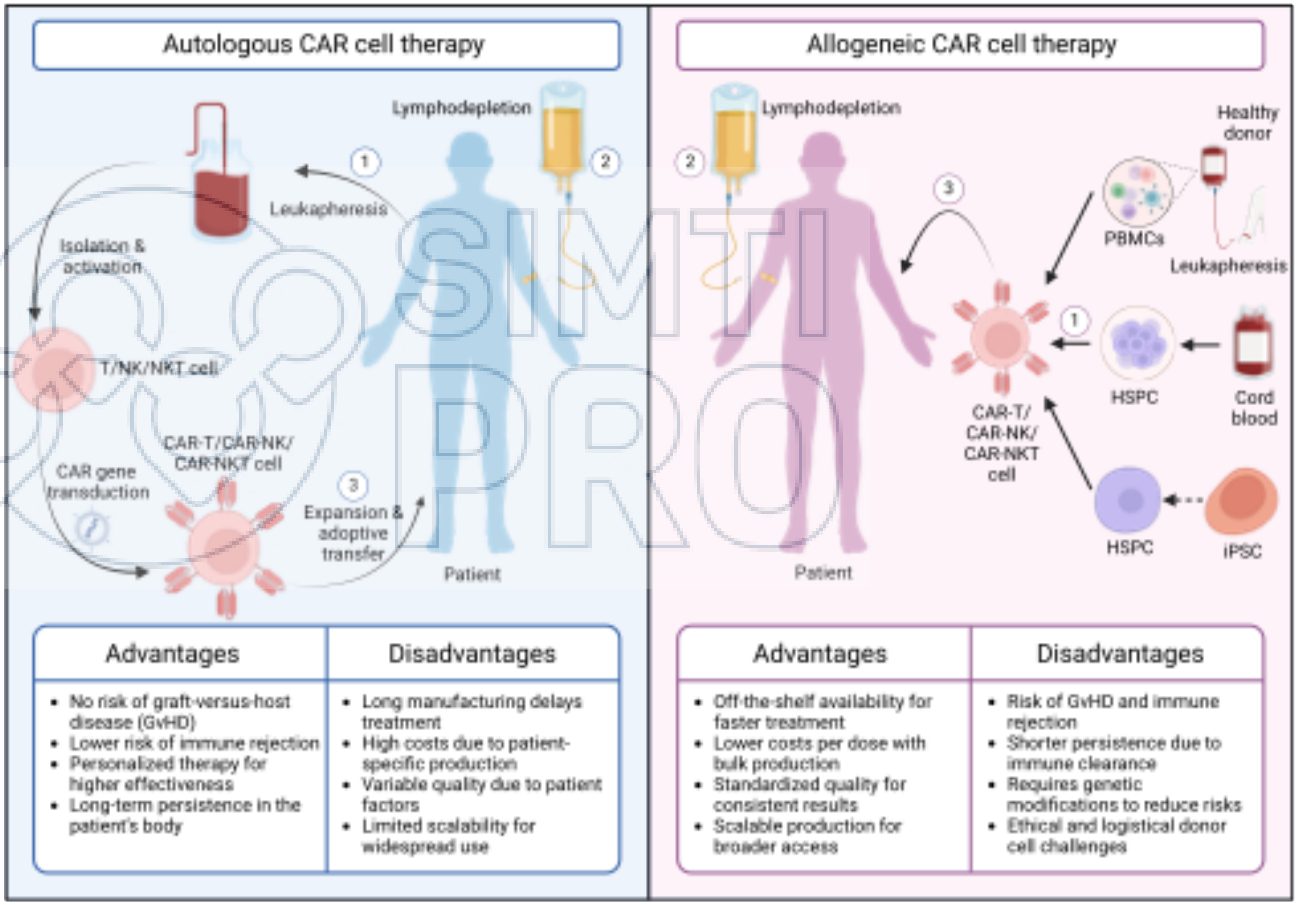
Potential Risks and Ethical Considerations of AI in Apheresis

Category	Risk /Ethical Concern	Description
Data Privacy & Security	Patient Data Breach	AI systems require large datasets, increasing vulnerability to unauthorized access and cyberattacks.
	Inadequate Data Anonymization	Failure to properly anonymize data can compromise patient confidentiality.
Algorithmic Bias	Inequitable Treatment Outcomes	Biased training data can result in discriminatory or suboptimal recommendations for certain populations.
	Lack of Representation	AI models may underperform in patients with rare diseases or from underrepresented groups.
Transparency & Accountability	Black-Box Decision Making	Difficulty in interpreting AI decisions may reduce clinician trust and hinder informed consent.
	Ambiguity in Liability	Unclear who is responsible—developer, provider, or clinician—if AI causes harm.
Clinical Reliability	Overdependence on AI	Excessive reliance may erode clinician judgment or critical thinking.
	False Positives / Negatives	Inaccurate predictions may lead to unnecessary procedures or missed complications.
Regulatory & Legal Issues	Lack of Standardized Regulations	Rapid AI development outpaces current legal and ethical frameworks.
	Compliance Challenges	Difficulties in aligning AI systems with international medical and ethical standards.
Human-Centered Care	Reduced Human Interaction	Automation may diminish patient–clinician relationships and empathy in care delivery.
	Consent Complexity	Patients may not fully understand the role of AI in their treatment, complicating informed consent.

Nuove sfide

ATMP: applicazioni in malattie autoimmuni e tumori solidi

CAR.T Allogeniche



ATMP: applicazioni in malattie autoimmuni e tumori solidi

Nuove sfide

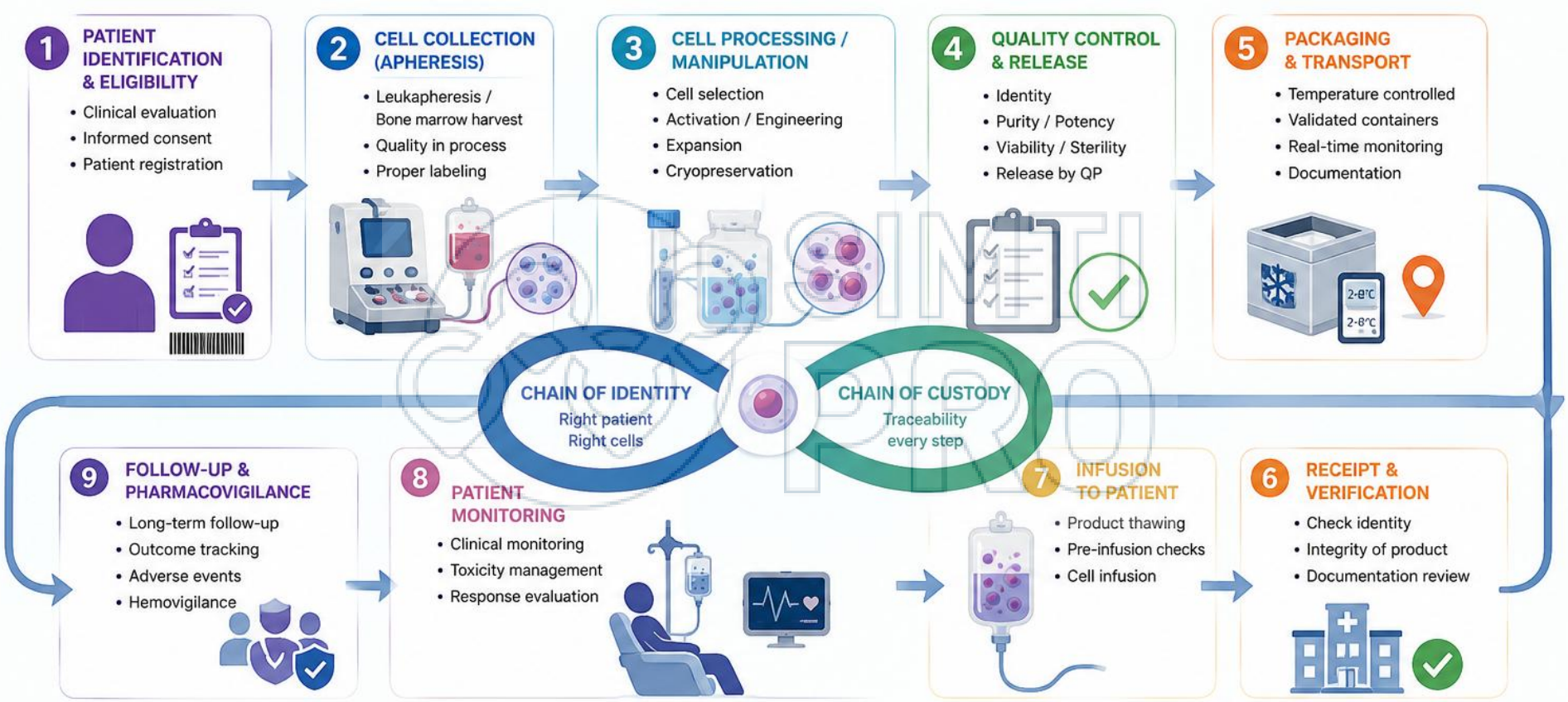
CAR.T Allogeniche

INNOVATIVE CELLULAR THERAPIES FOR AUTOIMMUNE DISEASES: expert-based position statement and clinical practice recommendations from the EBMT practice harmonization and guidelines committee (eClinicalMedicine 2024)

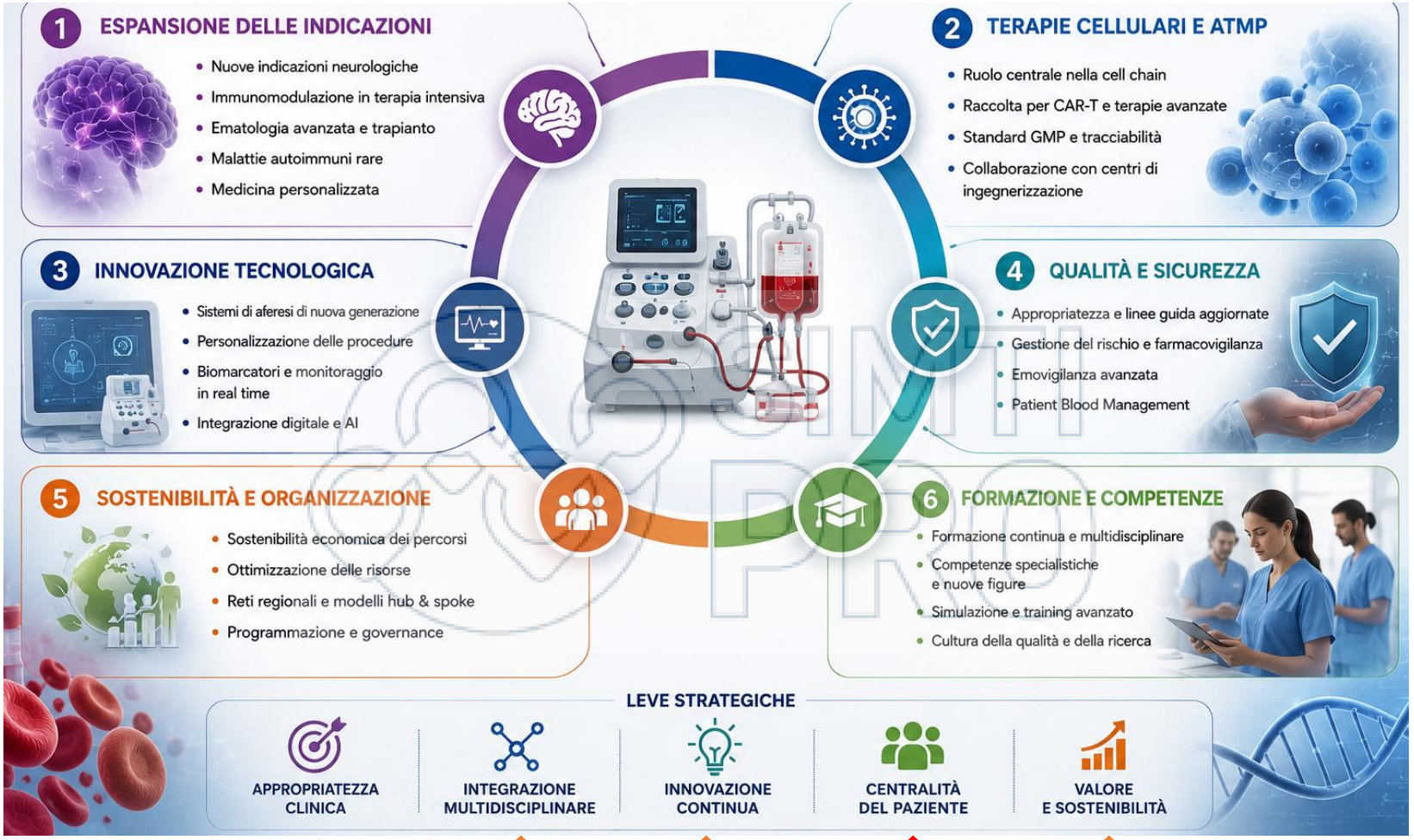
CELLULAR THERAPIES (CT) for **Autoimmune Diseases rheumatological, neurological, and gastroenterological**: mesenchymal stromal cells (**MSC**), Chimeric Antigen Receptors T cells (**CART**) and regulatory T cells (**Tregs**)

ADs	Criterion	Cellular Therapies
Multiple Sclerosis Neuromyelitis optica spectrum disorder Myastenia gravis Systemic Lupus Erythematosus Systemic Sclerosis Rheumatoid Arthritis Sjögren's syndrome Polymyositis	Performance status Prior treatments, including prior immunosuppressive treatment Infections CNS involvement Disease confirmation Cardiac, kidney, liver function Fertility	**CAR.T** **MSC** **Tregs**

Cell Chain + Chain Identity + Chain of custody



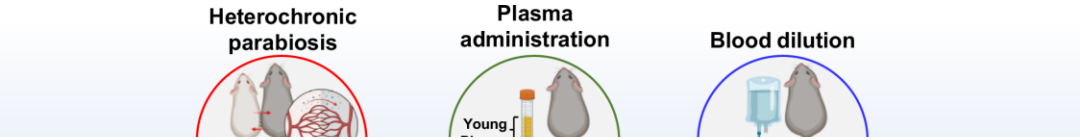
SVILUPPI IN AFERESI TERAPEUTICA



Complessità organizzativa → Necessità di personale dedicato

Blood as the mirror and modulator of aging: mechanistic insights and rejuvenation strategies

Experimental & Molecular Medicine (2026)



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