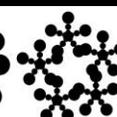
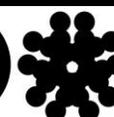




SHEBA
Tel HaShomer
City of Health

NATIONAL PRIORITIES FOR MILITARY MILD TBI / CONCUSSION SCREENING, DIAGNOSIS, & TREATMENT

Prof. Raquel C. Gardner MD



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& Health Sciences**
Tel Aviv University

Cognitive Neurologist – TBI Scientist

Sagol Neuroscience Center, Sheba

LET'S ALL AGREE ON WHAT WE ARE TALKING ABOUT:

English term	Hebrew term	Abbreviation / Notes
Traumatic Brain Injury (TBI)	פגיעה מוחית חבלתית	פמ"ח
Mild TBI	פמ"ח קלה	LOC של 0 עד פחות מ-30 דקות ו-13GCS-15
Complicated mild TBI	פמ"ח קלה מסובכת	פמ"ח קלה עם חבלה תוך-גולגולתית
Concussion	זעזוע מוח	פמ"ח קלה ללא חבלה תוך-גולגולתית
Impact concussion	זעזוע מוח על רקע חבטה	מנגנון: חבטה
Blast concussion	זעזוע מוח על רקע הדף	מנגנון: הדף

LET'S ALL AGREE ON WHAT WE ARE TALKING ABOUT:

English term	Hebrew term	Abbreviation / Notes
Repeated sub-concussive head impacts	חשיפות חוזרות לחבטות ראש תת־זעזועיות	ללא זעזוע מוח בודד מוגדר
Repeated low-level blast / blast overpressure	חשיפה חוזרת להדף בעוצמה נמוכה	ללא זעזוע מוח בודד מוגדר

השלכות הצבאיות

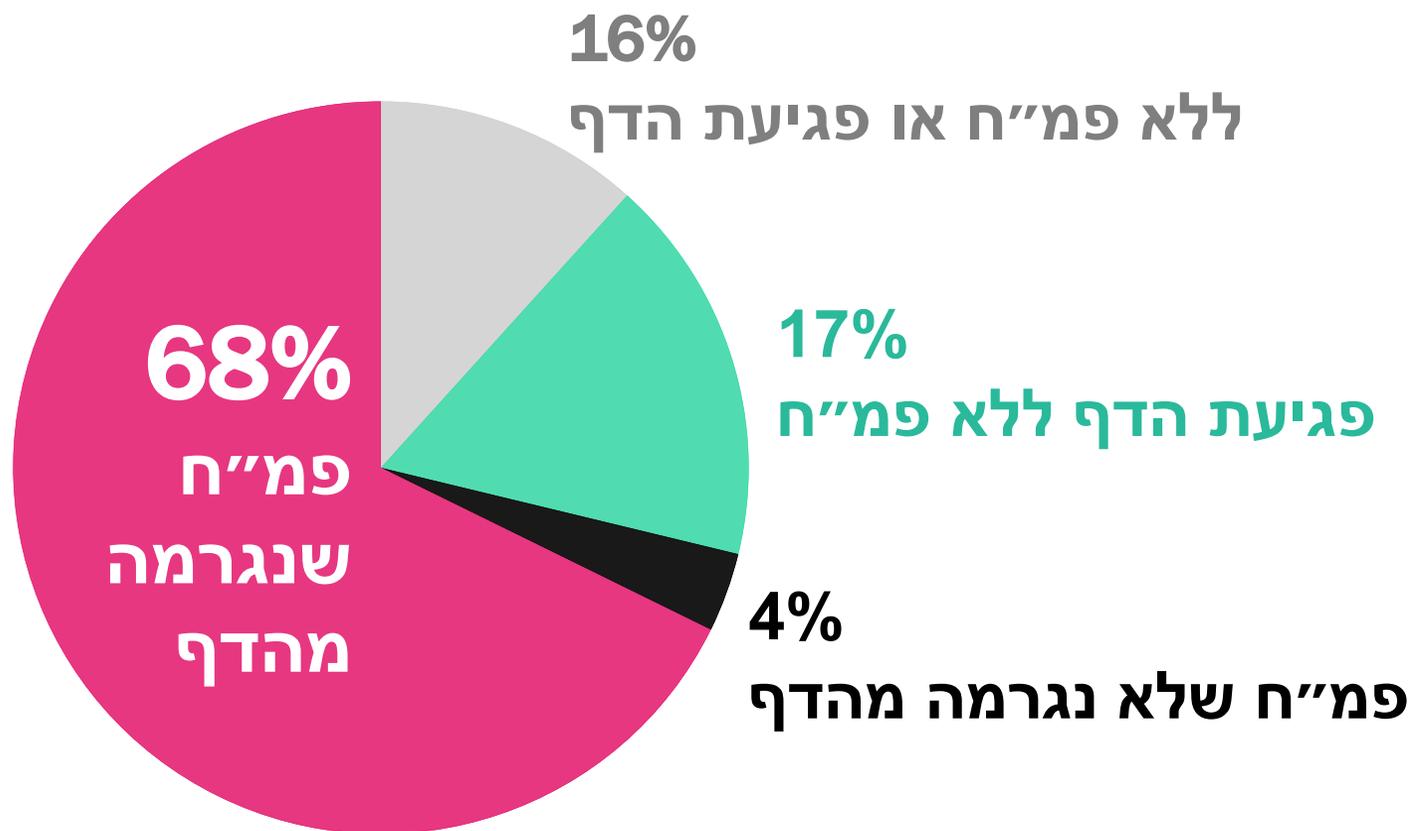


20% מהלוחמים האמריקאים בעירק/אפגניסטן חוו פמ"ח

עלייה של 50% בסיכון ל"לא כשיר לשירות"

\$20,000 דולר יותר בהוצאות רפואיות לעומת לוחמים ללא פמ"ח

נתוני שיבא



7 מכל 10 לוחמים
הפצועים שאושפזו
בשיבא
עם CT ראש תקין
סבלו מפגיעה מוחית
חבלתית

נתוני שיבא

94% של
פגיעות מוחיות
מהדף

7 מכל 10 לוחמים
הפצועים שאושפזו
בשיבא
עם CT ראש תקין
סבלו מפגיעה מוחית
חבלתית



בהשוואה לחיילים פצועים
ללא פמ"ח

נתוני שיבא

חיילים פצועים עם פמ"ח יש תסמינים פי

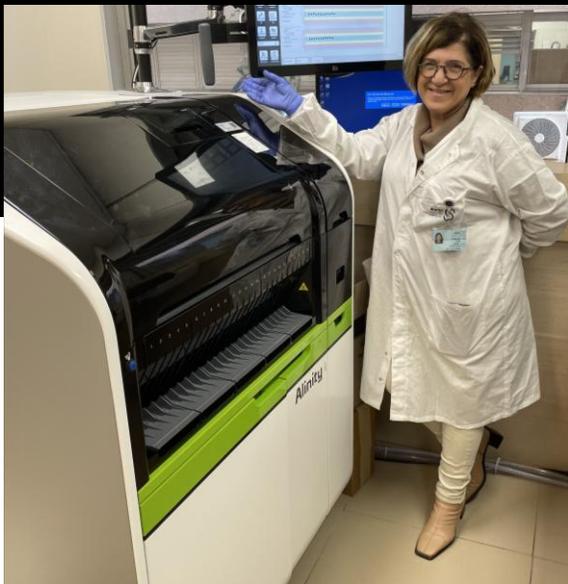
3x

בעיות שינה	תסכול
קושי בזיכרון	ראייה כפולה

2x

רגישות לאור	רגישות לרעש	סחרחורת	כאב ראש
ראייה מטושטשת	חשיבה איטית	קושי בריכוז	עייפות
			אי שקט

נתוני שיבא



**OBJECTIVELY
ASSESS MILD TBI
AT THE POINT OF CARE**



**6 מכל 10 לוחמים
הפצועים שפוננו על ידי
669 לשיבא -
תוצאות גבוהות
בבדיקת דם לפגיעה
מוחית חבלתית**

נתוני שיבא



הקריה האקדמית אונו

Ono Academic College

2 מכל 10 לוחמים
שלא נפצעו שחזרו
ללימודים באונו סבלו
מפגיעה מוחית
חבלתית

IN U.S. MILITARY VETERANS TBI WITHOUT LOC ASSOCIATED WITH >2 X RISK OF DEMENTIA

JAMA Neurology | Original Investigation

Association of Mild Traumatic Brain Injury With and Without Loss of Consciousness With Dementia in US Military Veterans

Deborah E. Barnes, PhD, MPH; Amy L. Byers, PhD, MPH; Raquel C. Gardner, MD; Karen H. Seal, MD, MPH; W. John Boscardin, PhD; Kristine Yaffe, MD

Figure. Cumulative Incidence of Dementia by Traumatic Brain Injury (TBI) Severity

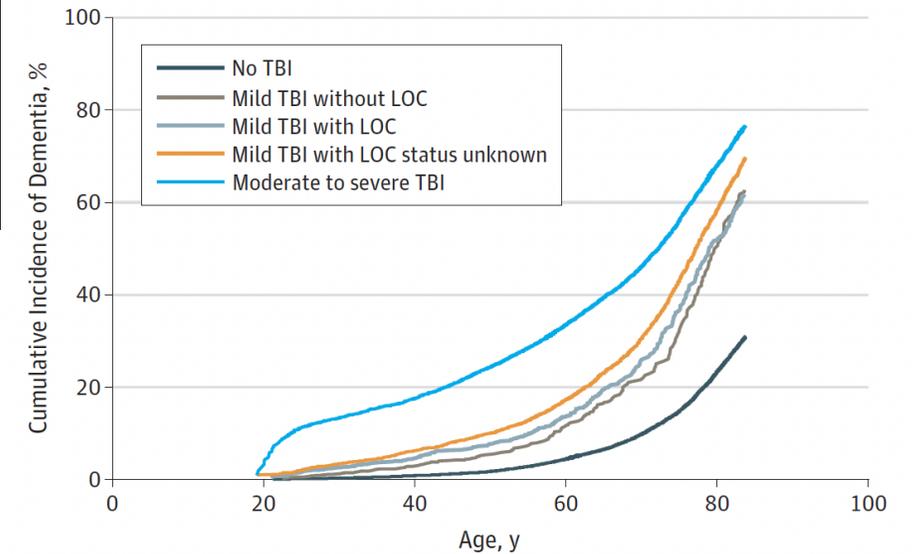


Table 2. Unadjusted and Adjusted Risk of Dementia by Traumatic Brain Injury Severity (N = 357 558)

Model	Participant Group, Hazard Ratio (95% CI) ^a					
	Individuals Without TBI (n = 178 779)	Individuals With ≥1 TBI (n = 178 779)	Mild TBI Without LOC (n = 17 759)	Mild TBI With LOC (n = 23 097)	Mild TBI With LOC Status Unknown (n = 55 004)	Moderate to Severe TBI (n = 82 919)
Unadjusted	1 [Reference]	3.41 (3.29-3.53)	2.29 (2.04-2.58)	2.48 (2.26-2.72)	3.11 (2.97-3.25)	3.75 (3.61-3.89)
1 ^b	1 [Reference]	3.41 (3.30-3.53)	2.32 (2.06-2.61)	2.48 (2.26-2.72)	3.11 (2.97-3.25)	3.73 (3.60-3.88)
2 ^c	1 [Reference]	3.41 (3.29-3.53)	2.34 (2.08-2.63)	2.50 (2.28-2.75)	3.16 (3.02-3.31)	3.71 (3.57-3.85)
3 ^d	1 [Reference]	3.45 (3.33-3.57)	2.36 (2.10-2.66)	2.51 (2.29-2.76)	3.19 (3.05-3.33)	3.77 (3.63-3.91)

Medical and Psychiatric Risk Factors for Dementia in Veterans with and without Traumatic Brain Injury (TBI): A Nationwide Cohort Study

R.C. Gardner^{1,2,3}, D.E. Barnes⁴, Y. Li^{2,4}, J. Boscardin⁵, C. Peltz⁴, K. Yaffe^{1,2,4,5}

Risk Factor Prevalence	TBI	No TBI
Hypertension	66%	53%
Coronary artery disease	35%	22%
Diabetes	30%	22%
Cerebrovascular disease	16%	5%
Epilepsy	7%	1%
Depression	35%	14%
PTSD	22%	7%

EMERGING EVIDENCE:

BRAIN INJURY LOW LEVEL BLAST EXPOSURE

(FROM FIRING HEAVY ARTILLERY OR “BREACHING

DOD Provider Fact Sheet | July 2023
Information on Low-Level Blast Exposure
Traumatic Brain Injury Center of Excellence

What is Low-Level Blast?

Blast generated from firing heavy weapon systems or explosives in combat or training environments. Exposure to low-level blast does not typically result in a clinically diagnosable concussion or mild traumatic brain injury.



LLB Exposure May Cause

- Concentration problems
- Irritability
- Memory problems
- Slowed thinking/slow reaction time
- Decreased hand-eye coordination
- Difficulty hearing
- Headaches
- Tinnitus

What Should Medical Providers Do?



Ask

When taking a patient's history, ask about LLB exposures and assignment to high-risk military occupation(s).



Document

Document in the medical record:

- Military occupation(s)
- Estimate of total LLB exposures (e.g., weapon systems, duration of exposure, number of blasts)
- Experience as a military training instructor
- Years in high-risk occupation/unit (e.g., MOS/ NEC/ AFSC)



Manage

Symptoms related to LLB exposure may resolve with rest. For persistent symptoms:

- Provide the patient with the [LLB fact sheet for service members](#)
- Consider traditional mTBI treatments such as [PRA](#)
- For additional resources, refer to [Health.mil/ TBIProviders](#)

Research is still emerging on the full impact of LLB exposure on brain health and performance outcomes.



FLEXIBLE MOUNTING:

HEAD
SHOULDER
CHEST



ANS: Please use the table below to help us quantify your approximate lifetime blast exposure. For the purpose of this survey, "exposure" is defined as any incident where you physically felt the overpressure wave whether the blast was the result of an incoming enemy fire or a charge or munition that you fired or were near to. Exposure does not mean events in which you observed a blast but did not feel its pressure wave. We are only looking for gross estimates so this assessment should take approximately 5-10 minutes to complete.

Weapon/Ordnance	Select the approximate range of lifetime blast exposures (see definition above)	What percentage of these exposures were training-related vs. operational? (e.g., 60/40, 20/80)	What percentage of these TRAINING-related exposures were incoming vs. outgoing? (e.g., 60/40, 20/80)	What percentage of these OPERATIONAL exposures were incoming vs. outgoing? (e.g., 60/40, 20/80)
Hand grenades, flash bangs, landmines, claymores	<input type="radio"/> None <input type="radio"/> 1-10 <input type="radio"/> 11-100 <input type="radio"/> 101-500 <input type="radio"/> 500+	Training % / Operational % ____ / ____	Incoming % / Outgoing % ____ / ____	Incoming % / Outgoing % ____ / ____
Handheld weapons, e.g., RPG, LAW, SMAW, Dragon, GUSTAV, AT4, Javelin, grenade launcher	<input type="radio"/> None <input type="radio"/> 1-10 <input type="radio"/> 11-100 <input type="radio"/> 101-500 <input type="radio"/> 500+	Training % / Operational % ____ / ____	Incoming % / Outgoing % ____ / ____	Incoming % / Outgoing % ____ / ____
Artillery, missile launchers, mortars, etc. (danger close)	<input type="radio"/> None <input type="radio"/> 1-10 <input type="radio"/> 11-100 <input type="radio"/> 101-500 <input type="radio"/> 500+	Training % / Operational % ____ / ____	Incoming % / Outgoing % ____ / ____	Incoming % / Outgoing % ____ / ____
Other	<input type="radio"/> None <input type="radio"/> 1-10 <input type="radio"/> 11-100 <input type="radio"/> 101-500 <input type="radio"/> 500+	Training % / Operational % ____ / ____	Incoming % / Outgoing % ____ / ____	Incoming % / Outgoing % ____ / ____

ADDITIONAL QUESTIONS:
 Year of first and most recent blast exposure (e.g., 2012): _____
 Do you have experience around heavy weapons being fired? (circle)
 YES NO If YES, for how many years? _____
 Have you ever been an instructor (formal or otherwise) in breaching-related training? (circle)
 YES NO If YES, for how many years? _____
 Have you ever been an instructor (formal or otherwise) in EOD or blast demolition training? (circle)
 YES NO If YES, for how many years? _____

Any feedback you may have here: _____

WHAT IS A "SAFE" AMOUNT OF BLAST OVER- PRESSURE?

We have no idea.

Based on several studies in U.S. military personnel exposed to blasts in the context of training, the U.S. military has implemented a 4 PSI blast overpressure maximum threshold for their military for any one training activity.

Blast magnitudes measured by The Times at an indoor gun range

Gun and ammunition	Avg. P.S.I.	Type
.50 BMG rifle	6.7	 Used by: Snipers and Special Forces
.50 AE Desert Eagle	3.4	
.500 Mag. revolver	2.9	
.357 Mag. revolver	1.8	
AR-15, 5.56 mm	1.6	
9-mm pistol	1.3	
Bullpup rifle, 5.56 mm	1.1	 Most common in IDF
12-gauge shotgun	1.0	
1911 pistol, .45 ACP	1.0	

Note: Measurements shown are the average of the three highest readings for weapons fired from inside a range booth.

אלפים עם פמ"ח נסותרת

אנו מעריכים...

עד 70% מהלוחמים הפצועים שמטופלים בבתי החולים

$$0.7 * 6,333 = \text{עד } 4,374 \text{ מקרים של פמ"ח}$$

עד 20% מהלוחמים שלא נפצעו, ושחוזרים ללימודים/לעבודה

$$\sim 0.2 * 100,000 = \text{עד } 20,000 \text{ מקרים של פמ"ח}$$

סה"כ יותר מ-24,000

THE NEW REALITY IN ISRAEL

- **Thousands** of working-age Israelis are living with **war-related mild TBI**, mostly from **blast**.
- Most are not diagnosed and not in treatment.
- All are at **immediate risk for** under-achievement professionally & personally (many many many published studies).
- All are at **long-term risk for** accelerated brain aging and neurodegeneration (many many many published studies)
- **Our brains are our most precious national resource.**
- **We must act now to protect and optimize the potential of this precious national resource now and across the entire life-course.**



צעדים
מומלצים
להמשך

1. SCREEN ALL SOLDIERS WHO SERVED IN THE IRON SWORDS WAR FOR MTBI* & CREATE A NATIONAL REGISTRY

PROGRESS REPORT:

- Concussion Israel (Gilad Sorek) preparing to write national protocols to support evidence-based, fair, reliable national screening for military MTBI.
- Forming new TBI Iggud under Ministry of Health (Osnat Granot)
- Multi-disciplinary MTBI clinics have opened at Ichilov, Levenshtein, Reut, and Poria.
- Sheba planning to launch FDA-approved TBI “troponin” blood test in ED for use on day-of-injury to aid in evaluation of mTBI in ED.



IMMEDIATE NEXT STEPS TO OPTIMIZE SUCCESS

- Administrative oversight from [STATE ENTITY] to support screening protocol development, nationwide dissemination, and build a national registry.
- National training program to **certify MTBI screening centers** at community-based clinics to ensure fair/equitable screening/diagnosis.
- **App to support first-level screening** to triage patients to in-person second-level screening by a certified MTBI screening center.
- **Add TBI blood test to health basket** to aid in evaluation of TBI on day-of-injury for all combat casualties.

***OFFER POST-MORTEM BRAIN
AUTOPSY TO EVERY FAMILY OF A
SOLDIER WHO DIES OF SUICIDE TO
SCREEN FOR SPECIFIC TRAUMATIC
NEUROPATHOLOGIES THAT HAVE
BEEN LINKED TO SUICIDE IN U.S.
SOLDIERS.**

Chronic Traumatic Encephalopathy (CTE)

Linked to repetitive impact



Interface Astroglial Scarring (IAS)

Linked to repetitive blast



2. PROVIDE EVIDENCE INFORMED MULTI-DISCIPLINARY SYMPTOMATIC TREATMENT TO RETURN THOSE WITH MTBI TO LIFE AHEAD

PROGRESS REPORT:

- We have 1 MTBI clinic in the North, 3 in the Center, and 0 in the South.

IMMEDIATE NEXT STEPS TO OPTIMIZE SUCCESS

- Allocate TEKEN for 10 multi-disciplinary MTBI treatment clinics across Israel
- National program to certify and oversee MTBI treatment centers.
- Apps to support efficient and consistent delivery of evidence-based EDUCATION & TREATMENT to patients/families.
- Apps to support efficient and consistent provider education & adherence to MTBI treatment guidelines.

3. PROVIDE EVIDENCE-INFORMED MULTI-DISCIPLINARY **LIFE-LONG PREVENTION** FOR FUTURE HIGH-RISK CHRONIC EFFECTS OF MTBI

PROGRESS REPORT:

IMMEDIATE NEXT STEPS TO OPTIMIZE SUCCESS

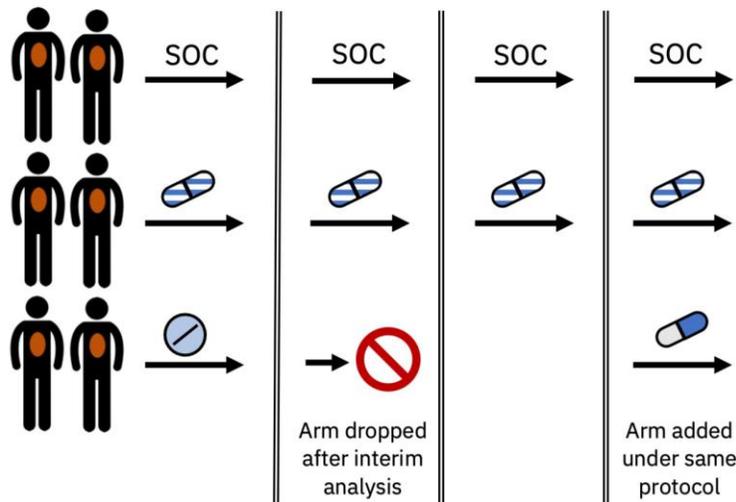
- Administrative oversight from [STATE ENTITY] to conduct **scoping review of the evidence** to identify highest-yield, evidence-informed, EARLY INTERVENTIONS to implement first.
- Allocate TEKEN for **10 warfighter brain optimization clinics across Israel**
- National program to **certify and oversee warfighter brain optimization clinics.**

4. INVEST IN PRAGMATIC HIGH-IMPACT SCIENCE TO DISCOVER BETTER WAYS TO REPAIR AND OPTIMIZE BRAIN HEALTH AFTER MTBI

NATIONAL WARFIGHTER BRAIN OPTIMIZATION

Platform trial

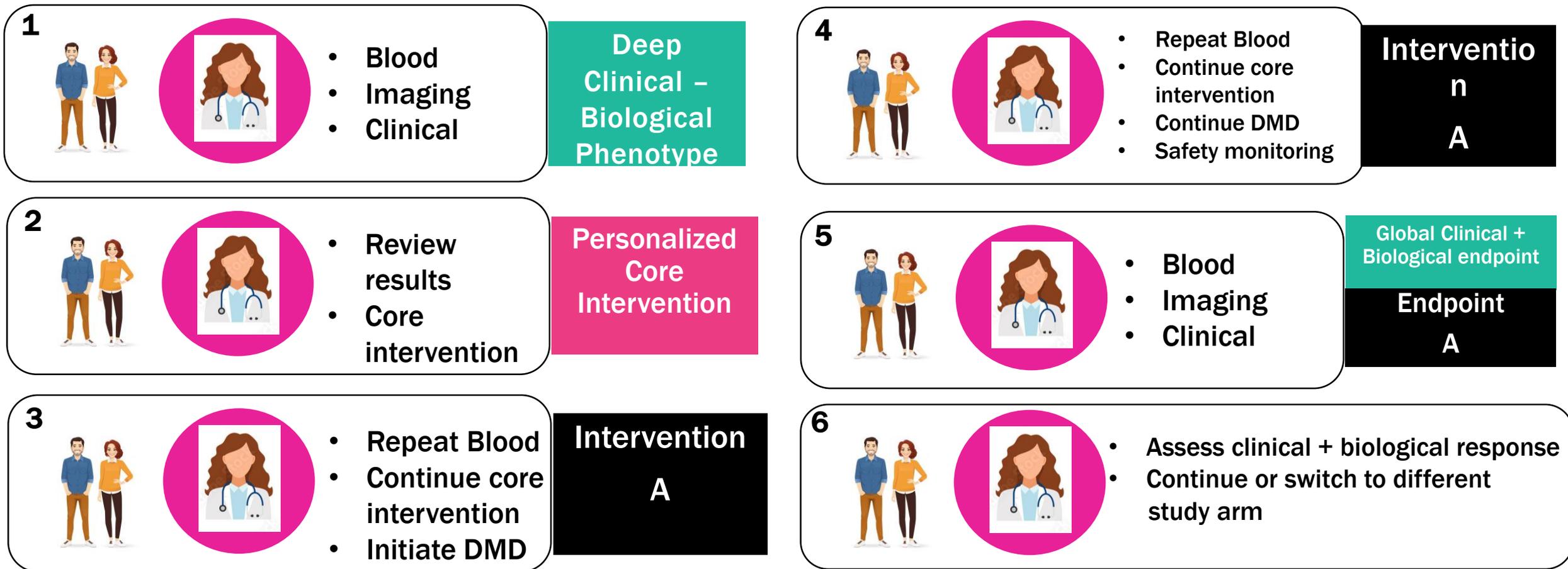
Single master protocol; can add and drop treatments and diseases over time



CLINICAL TRIALS ARENA

AGILE
FAST
INNOVATION

כל לוחם, בכל גיל, יעבור פנוטיפ עמוק, ולאחריו הפחתת גורמי סיכון מבוססת-ראיות בהתאמה אישית (התערבות ליבה), עם או בלי התערבות חדשנית ברפואה מותאמת-אישית.



זכרו את ילדי הגזת

- **The State irradiated the scalps of 20,000 children in the 1940s-50s.**
- **Later, we learned that this caused serious injury with life-long consequences.**
- **A law was written to provide these 20,000 immigrants with extra health benefits for all health conditions associated with that exposure for the rest of their lives.**

זכרו את ילדי הגזת

- The State irradiated the scalps of 20,000 children in the 1940s-50s.
- Later, we learned that this caused serious injury with life-long consequences.
- A law was written to provide these 20,000 immigrants with extra health benefits for all health conditions associated with that exposure for the rest of their lives.

- ~20,000 working-age Israelis are living with war-related mTBI.
- We have 25+ years of research that already tells us EXACTLY what they are now at risk for.

It is clear what must be done.



QUESTIONS

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www.gardnerlab.health