

Project name

Three stage proposal for providing tourniquets in Gaza

Authors

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Description

Tourniquets save lives and have resulted in a lower than expected mortality rate in Gaza over the past year since the introduction of an active Stop Bleeding campaign and the local manufacture of tourniquets. Unfortunately, tourniquets remain irregularly and poorly stocked in ambulances and emergency departments due to the lack of central funding and a coordinated strategy. Recent attacks by Israeli forces also demonstrate the importance of tourniquet training and distribution to lay citizens in Gaza.

This proposal seeks to address this deficit in a timely and sustainable way. This project divides the Stop Bleeding strategic plan into three components, constituting an incremental staged approach to achieving wide deployment.

Project stages

- **Stage 1: Prehospital and hospital provider deployment.** Prehospital and hospital providers would receive tourniquets for regular usage and usage during escalations and conflicts.
- **Stage 2: High impact community deployment.** Tourniquets would be deployed to high impact community sites such as grocery stores, bakeries, convenience stores, places of worship, schools, factories, major offices and athletic facilities. This stage would target 1,000 establishments with 100 tourniquets each.
- **Stage 3: Widespread community deployment and training.** Wide deployment of tourniquets to citizens' homes as well as all public and private establishments. This stage would also include public education and awareness campaigns to teach citizens about bleeding control.

Objectives

The Ministry of Health will:

- Coordinate and direct national Stop Bleeding strategy in Gaza with prehospital and hospital services
- Ensure sufficient stock for all prehospital and hospital stakeholders
- Acquire tourniquets in Gaza
- Seek international funding in collaboration with World Health Organization
- Coordinate public health campaign for training lay citizens about tourniquets and their usage
- Monitor usage of tourniquets in Gaza

The World Health Organization will:

- Coordinate funding for acquisition of tourniquets in Gaza
- Monitor usage of tourniquets in Gaza
- Seek international funding in collaboration with the Ministry of Health

Prehospital care providers will:

- Ensure each vehicle is stocked with tourniquets
- Provide training to prehospital providers
- Monitor tourniquet usage
- Report any tourniquet device failures in the field

Hospital emergency providers will:

- Ensure appropriate device stocks
- Provide training to hospital providers likely to use tourniquets
- Monitor tourniquet usage
- Report any tourniquet device failures in emergency rooms

Palestinian establishments will:

- Stock “Stop Bleeding” campaign kits
- Ensure kits are easily available and maintained

Palestinian lay citizens will:

- Participate in public education campaigns to learn about tourniquets
- Stock small supplies of “Stop Bleeding” campaign kits for home use

Context

The war in Gaza in 2014 had devastating losses, many of which were related to exsanguination from limb injury. While precise numbers are difficult to obtain due to the nature of the war, it is clear that many deaths were preventable with an appropriate layperson and prehospital awareness of hemorrhage control. If current hemorrhage control practices were in place in 2014, it is expected that several hundred lives would have been saved. While it is still early, emerging data from the 2021 war in Gaza indicate that tourniquet usage may have prevented deaths.

In late 2016, several government and non-governmental agencies started work on a hemorrhage control training program now referred to as the “Stop Bleeding Campaign”. This campaign has trained over two hundred providers and provided thousands of tourniquets for training and deployment in the field.

Unfortunately, there remains no coordinated national strategy for the acquisition and distribution of tourniquets among prehospital and hospital providers across at least four government and non-governmental agencies. As such, there is also no coordinated strategy for funding tourniquets, with all of the tourniquets provided to prehospital providers thus far being donated by Glia Inc and Hayat Centre.

Despite this lack of coordination, it is clear that the current Stop Bleeding Campaign is bearing fruit. Between 30 March 2018 and 30 March 2019, at least 5,420 out of 6,872 gunshot wounds were to the lower limbs and 549 to the upper limbs, a total of 87.9% of all injuries. Despite this high number, there have been only 12 fatalities from these injuries, representing 0.2% of all limb gunshot wounds.

Many factors are responsible for this unexpectedly low number, including a system-wide emphasis on early trauma care. However, it is certain that the use of tourniquets when available and improvised tourniquets when not available contributed to this disproportionately low mortality rate.

Intended beneficiaries

- Ministry of Health (Palestine) – creation of needed medical devices
- Palestinian Red Crescent Society – continuing training and support of their 3D modeling team
- Military Medical Services
- Civil Defence
- World Health Organization

Strategic partners

- Ministry of Health (Palestine)
- Palestinian Red Crescent Society – continuing training and support of their 3D modeling team
- Military Medical Services
- Civil Defence
- World Health Organization
- International Committee of the Red Cross
- University of Western Ontario (Canada)
- London Health Sciences Centre (Canada)
- Health Canada
- Glia Inc

Methodology and activities

Prediction of future usage during non-emergency

We predicted the usage of tourniquets in prehospital and hospital settings after consultation with providers and leaders in major prehospital and hospital organizations based on current usage patterns.

Note that for several reasons, prehospital usage is expected to be significantly higher than hospital usage, as reflected in the projected usage numbers.

Table 1. Projected prehospital usage of tourniquets

Ambulance service	Total ambulances	Daily active ambulances	Projected annual tourniquet usage
Ministry of Health	64	10	400
Palestinian Red Crescent	60	10	600
Civil Defense	13	8	500
Military Medical Services	13	7	400
Total	150	35	1900

Table 2. Projected emergency department usage of tourniquets

Hospital	Projected annual tourniquet usage
Al Shifa Hospital	60
European Gaza Hospital	60
Indonesian Hospital	36
Al-Aqsa Hospital	36
Al-Quds Hospital (NGO)	36
Al-Awda Hospital (NGO)	36
Total	265

Prepositioned stock for use during disaster or crisis

Prepositioned stock should provide tourniquets in the event of a disaster or crisis. Because of the critical and lifesaving nature of tourniquets, we projected a 30-day prepositioned stock to be distributed via the Ministry of Health.

The index casualty rate was derived from the first 30 days of the 2014 war and projected at 7,000 injuries. The limb injury rate was projected from the current Grand March of Return figures at 87.9%, resulting in an expected usage rate of 6,153. Considering stocking and distribution factors, a proposed number of 7,000 tourniquets is suggested for 30-day prepositioned stock.

As tourniquets do not expire, a decreased risk of future hostilities would result in depleting the prepositioned stock to an accepted level over time.

Deployment of tourniquets to high impact community sites

During wars such as those experienced in 2012, 2014 and 2021, it was difficult for prehospital teams to attend to all wounded patients. This was due to the large number of wounded, infrastructure destruction, and direct targeting of prehospital teams. During the 2021 war, targeting of road infrastructure made it difficult to access hospital centers.

A successful international model for Stop Bleeding campaigns such as those in the United States utilizes public establishments as cost effective depots of kits that include tourniquets and other first aid supplies. The second stage of this project would involve deployment of tourniquets and Stop Bleeding kits to high impact community sites such as grocery stores, bakeries, convenience stores, places of worship, schools, factories, major offices and athletic facilities.

This stage would target 1,000 establishments with 100 tourniquets each, distributed according to an assessment of population density and anticipated needs based on previous usage patterns.

Deployment of tourniquets to private homes

The third stage would involve the deployment of tourniquets to private homes for use by lay citizens as part of a public health and education campaign. While a needs assessment would need to be carefully done to assess the exact number, it would be expected to be between 500,000 and 750,000 tourniquets, depending on expected conditions during a conflict.

Tourniquet cost

Depending on the type of tourniquet and the need to import it, tourniquets may cost as little as USD\$10 for locally manufactured tourniquets and as much as \$40 for imported commercial tourniquets. As there are currently two high quality manufacturers of tourniquets in Gaza, we assumed a USD\$10 cost per tourniquet.

Outputs and deliverables

Tourniquet supply across three stages of project

Table 3 shows the expected purchase of tourniquets for normal use and prepositioned stock for prehospital and hospital usage in Stage 1 is listed below. These numbers assume a population growth of 3% and one major conflict every 3 years. Projections are over the next 5 years.

Tables 4 and 5 show expected numbers for Stage 2 and Stage 3 of the project. Table 6 shows the projected combined total if all three stages are implemented simultaneously.

Table 3. Projected tourniquet purchase requirements 2021-2025, Stage 1

Year	Normal use	Prepositioned stock	Total required
2021	2 000	7 000	9 000
2022	2 060	0	2 060
2023	2 122	0	2 122
2024	2 186	7 000	9 186
2025	2 251	0	2 251
Total	10 619	14 000	24 619

Table 4. Projected tourniquet purchase requirements 2021-2025, Stage 2

Year	Normal use	Prepositioned stock	Total required
2021	500	50 000	50 500
2022	515	50 000	50 515
2023	530	0	530
2024	546	0	546
2025	563	5 000	5 563
Total	2 654	105 000	107 654

Table 5. Projected tourniquet purchase requirements 2021-2025, Stage 3

Year	Normal use	Prepositioned stock	Total required
2021	100	93 000	93 100
2022	103	100 000	100 103
2023	106	150 000	150 106
2024	109	143 000	143 109
2025	112	145 000	145 112
Total	530	631 000	631 530

Table 6. Combined projected tourniquet purchase requirements 2021-2025

Year	Total required
2021	152 600
2022	152 678
2023	152 758
2024	152 841
2025	152 926
Total	763 803

Quality control and assurance

There are several tourniquets available both locally and through the import market. Because tourniquet failures may result in death or serious disability, quality control and assurance is critical.

A joint task force under the direction of the Ministry of Health and consisting of representatives of prehospital and hospital providers will ensure that tourniquets are of appropriate quality.

International certifications such as CE, FDA or Health Canada can be used to ensure that rigorous quality standards are met.

Training

Training on the use of tourniquets will be covered in a separate complementary proposal.

Public health campaign

A public health campaign will be covered in a separate complementary proposal.

Usage monitoring

A joint task force under the direction of the Ministry of Health and consisting of representatives of prehospital and hospital providers will monitor tourniquet consumption and adjust required annual numbers based on usage patterns in Gaza.

Time frame

One year, renewable. Operating dates are September 1, 2021 to August 31, 2022.

Resources and budget

Tables 7, 8 and 9 show the projected purchases costs based on requirements calculated in Tables 3, 4 and 5. These costs assume a high quality supply ranging from USD\$10 for locally-produced tourniquets to USD\$40 for imported high quality tourniquets.

The requested budget for 2021-2025 for the implementation of the first year of Stage 1 is \$90 000 (USD) based on the realistic low estimate.

Table 7. Projected purchase costs based on high and low cost estimates 2021-2025, Stage 1

Year	Tourniquets	Low estimate (USD\$)	High estimate (USD\$)
2021	9 000	90 000	360 000
2022	2 060	20 600	82 400
2023	2 122	21 220	84 880
2024	9 186	91 860	367 440
2025	2 251	22 510	90 040
Total	24 619	246 190	984 760

Table 8. Projected purchase costs based on high and low cost estimates 2021-2025, Stage 2

Year	Tourniquets	Low estimate (USD\$)	High estimate (USD\$)
2021	50 500	505 000	2 020 000
2022	50 515	505 150	2 020 600
2023	530	5 300	21 200
2024	546	5 460	21 840
2025	5 563	55 630	222 520
Total	50 500	505 000	4 306 160

Table 9. Projected purchase costs based on high and low cost estimates 2021-2025, Stage 3

Year	Tourniquets	Low estimate (USD\$)	High estimate (USD\$)
2021	93 100	931 000	3 724 000
2022	100 103	1 001 030	4 004 120
2023	150 106	1 501 060	6 004 240
2024	143 109	1 431 090	5 724 360
2025	145 112	1 451 120	5 804 480
Total	631 530	6 315 300	25 261 200

Table 10. Combined projected purchase costs based on high and low cost estimates 2021-2025, all stages

Year	Tourniquets	Low estimate (USD\$)	High estimate (USD\$)
2021	152 600	1 526 000	6 104 000
2022	152 678	1 526 780	6 104 000
2023	152 758	1 527 580	6 104 000
2024	152 841	1 528 410	6 104 000
2025	152 926	1 529 260	6 104 000
Total	763 803	7 638 030	30 552 120

Communication strategy

Intra-group communication will be done with in-person meetings coordinated by the Ministry of Health, with email and by telephone between assigned contacts in each stakeholder.

External communication will be via twitter, facebook, instagram and public talks in Gaza and internationally.