



DESIGNING MOBILE PRIMARY HEALTH CENTER: DOES FORM FOLLOWS FUNCTION?

Md Haseen Akhtar* and Janakarajan Ramkumar

Department of Design, Indian Institute of Technology, Kanpur, India

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Abstract

A late 19th century principle of design “form follows function” states that the form of an object must primarily relate to its intended function, is still a debate. As Victor Papanek, an industrial designer of 20th century and a proponent of “form follows function” once said - “Design must be innovative, highly creative, cross disciplinary which makes it responsive to the needs of the user and this can be achieved with a more research-oriented mindset.” In the context of designing mobile Primary Health Center (mPHC), this argument has not been discussed in any literature. To address the same gap, this study synthesizes forty mobile health units design and architecture through the lens of form follows function. The main criteria used to evaluate was case study analysis, and five focus group evaluation. Further, the mobile units were scored on form and function on two parameters either existing (1) or not existing (0). The study examined mobile Primary Health Centers (mPHCs) across the globe through objective and subjective analysis. The results confirmed the hypothesis that form follows function at the overall system level but revealed that most sub-systems followed form first. The recommendations highlight the importance of balancing form and function while considering contextual constraints in complex systems like mPHCs for far flung regions.

Keywords: Form, Function, Mobile primary health center, Healthcare delivery model, Healthcare system, Healthcare infrastructure design

Introduction

The adage “form follows function,” popularized by architect Louis Sullivan (1856–1924), expresses the idea that an object's shape should correspond to its intended use or purpose. This idea served as the foundation for modernist architecture and industrial design in the 20th century. It is the guiding principle of all things organic and inorganic, physical and metaphysical, human and superhuman, of all true manifestations of the head, the heart, and the soul, that the life is recognizable in its expression, that “form always follows function”(Sullivan, 2010). Light enters the Church of the Light in Ibaraki, Osaka, from behind the altar through a cross-shaped opening in the concrete wall that runs horizontally from wall to wall and vertically from floor to ceiling, exactly coinciding with the joints in the concrete. A figure of the Buddha is concealed between two concrete walls in the Honpukuji Water Temple, with just the roof, a pond being visible. However, it was designed so that a sunbeam strikes the statue at sunset. The proverb “form follows function” is undoubtedly disproved by Ando's structures, whose forms are created to inspire new functions (Hwang, 2019). In the context of mobile clinics as a healthcare delivery model for low resource settings, the same counter arguments exist in their forms and functions. There are no literatures which talks about the architecture and its usability for mobile clinics. Furthermore, there are no literature which suggest that either form follows function or function follows form and what is best when designing such systems for low resource settings. The research question for which this study has enquired answers to: What is best to follow in case of designing mobile clinics for low resource settings? What are the best practices to follow when designing such systems? Thus, this study compares several state-of-the-art and synthesizes the findings as best ways and practices when designing mobile units for last mile people. The aim of this study is to investigate the design principles of mobile Primary Health Centers in low resource settings and determine whether 'form follows function' or 'function follows form' is more appropriate in this context. The methodology of the study has been illustrated in Figure 1 for reference.

*Corresponding author :< mdhaseendw20@iitk.ac.in>

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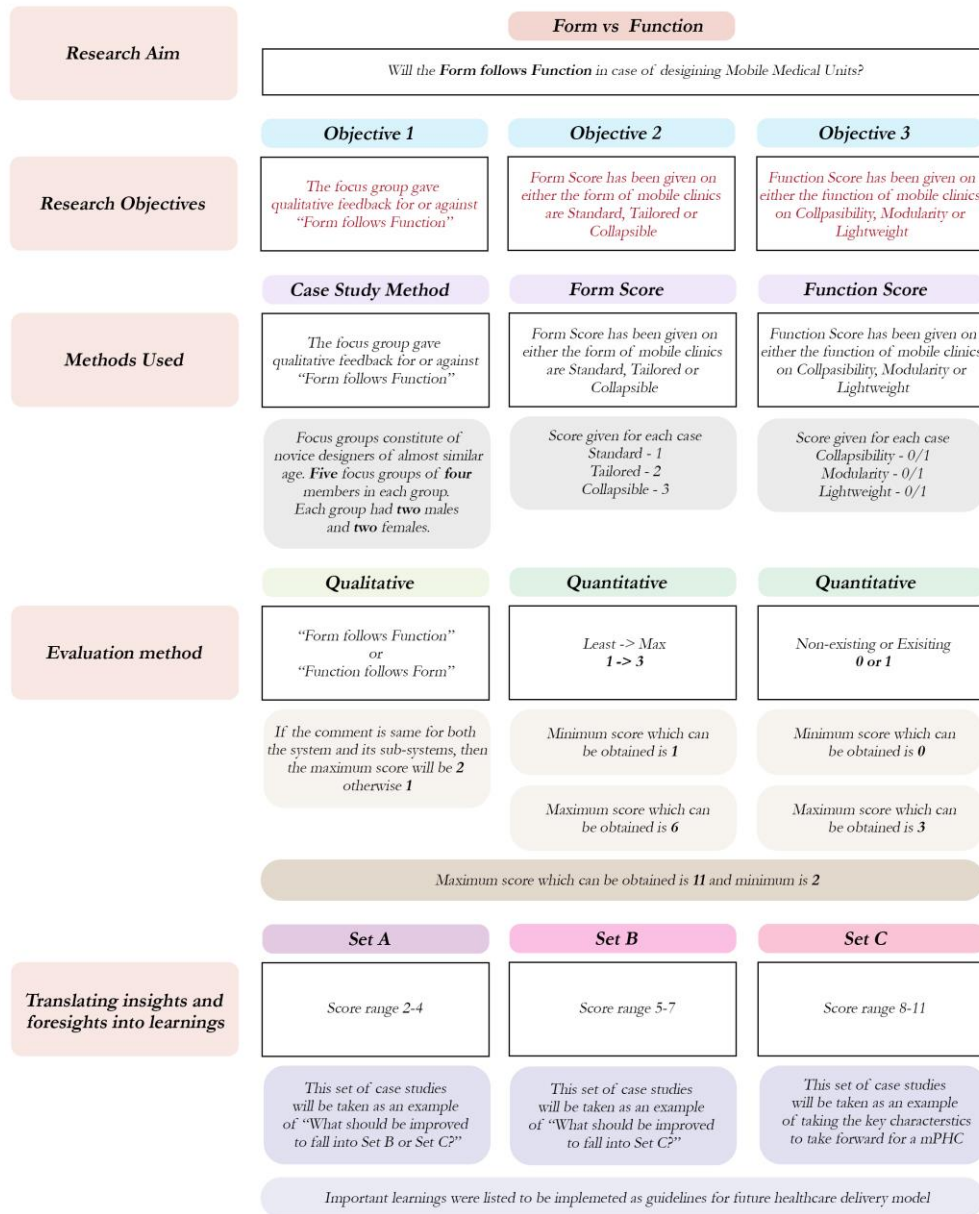


Figure 1. Research Design (Developed by Author)

Materials and Method

A mixed-method, based on quantitative (objective indicators) and qualitative (subjective indicators) approaches, was used to analyze form and function. The objective indicators proposed by Akhtar & Ramkumar (2023) for a robust mobile Primary Health Center (mPHC) includes:

- (a) Form: Standard, Tailored, Collapsible

(b) Function: Collapsibility (C), Modularity (M), Lightweight(L)


The objective indicators were marked as either 1 or 0 for existing and non-existing respectively. The subjective indicators include a questionnaire that was completed by each group during discussion. It was given to the focus groups who had been previously informed that the study would be conducted. They were asked to assess the dominant factor out of the two. The profile of the group members were quite similar. The majority were young novice designers. The five focus groups analyzed case studies each (Table 1 - Table 5).

The case studies were selected based on its mobility in service to far reaching places and from all transportation domains such as land, water and air for a wide range of discussion and comparison. The case studies range from mobile clinics on truck, bike, boat and airplane. They were analyzed based on services provided, infrastructure used, workforce deployed of that particular type of primary service in line with context. The effectiveness of form and function while providing services were analyzed to comment for or against the motion. Each group were given tasks to compare nearly 5-10 mPHCs globally to study the form, study the components (living and non-living), their functions and inter-relations between them. Four-person focus groups were formed to compare and contrast case studies. Followed by comments for or against the statement “form follows function” with some examples with a summary of their understanding of all the examples at the end. Finally, all the gathered insights from groups were translated into foresights which then further produced as best guidelines and practices to follows when designing mPHCs for low resource settings. The subjective indicators when translated were given scores to interpret results. If a case study overall system and sub-systems followed the same principle, it was given a maximum score of 2 otherwise 1. Therefore, this research analyzes the current state of the art and draws conclusions about the most effective strategies and techniques for designing and developing mobile units for the last mile.

Results and Discussion

All the five focus group case studies were analyzed and put into a thematic tabular form where we categorized the information into form, function and insights and foresights.

Table 1. Mobile Clinics (Credit: Authors Own)

Study case	Form - Standard, Tailored, Collapsible Function - Collapsibility (C), Modularity (M), Lightweight(L)	Form follows Function?
 SHIS, Sunderbans, West Bengal	Form follows Function – System Function follows Form – Sub-systems Score: 1 Standard and Tailored (Boat) – Score: 3 C (0), M(0), L(0) – Score: 0 Final Score: 4	The boat clinic's purpose is to offer necessary medical care in the Sunderban region's inaccessible and secluded islands. They offer medical care to the underprivileged, many of whom have no other access to care. On the ground or in the air, this would not have been practical or effective (even if made practicable). This is because these islands can only be reached by sea, necessitating the adoption of a morphology that is best suited for water. Additionally, the fact that it is open from the top lets the people know that medical services are made available to them. However, when it comes to strong downpours or rains, this openness from the top might also be a drawback. It's possible that using wooden planks to reach the boat from land is a



Igaracu Fluvial Mobile Clinic, Amazon, Brazil

Form follows Function – System
Form follows Function – Sub-systems
Score: **2**

Tailored and Standard (Boat) – Score: **3**

C (0), M(0), L(0) – Score: **0**

Final Score: **5**

transitory or unstable solution, which can be avoided by using a stronger or more stable material. As a result, form does follow function, although there are some aspects of form that can be improved.

Before the implementation of Igaracu, the healthcare personnel administered primary medical care to inhabitants of isolated riverbank communities by utilizing a shared wooden vessel that was leased by the local health governing body. This was unsuccessful, though, due to issues with privacy, the necessity of personal house visits for lab collection, the need to maintain track of samples, and the infrequent presence of medical professionals. The government later devised this Fluvial Boat Clinic, nevertheless. This was a design system that addressed the issue at hand. What was once a boat was later used exclusively for water transportation with greater space segregation and planning. The goal was to build the healthcare system more effectively. So, form comes after function.



Floating Clinic Boat, Lagos, Nigeria

Form follows Function – System
Form follows Function – Sub-systems
Score: **2**

Standard and Modular (Boat) – Score: **4**

C (0), M(1), L(0) - Score: **1**

Final Score: **7**

Increased access to fast, high-quality, and effective medical care in communities along rivers and waterways is the goal of the floating clinic boat's deployment. The boat's closed structure ensures that it will operate even during strong downpours. Inside the boat, modular parts make replacement and maintenance simple. Four components make up the boat's main body: the wheel house (for the captain and crew), the observation room (for patients), the doctors' and nurses' stations, and the reception. The boat moves more quickly thanks to the structure's external shape. The units inside can be fitted into this shape with ease as well. The monohull of the boat, combined with its lightweight fiberglass construction, allows for quick turns. So, form comes after function.



Lifeline Express, Rural

Function follows Form – System
 Function follows Form – Sub-systems
 Score: 2

Standard and Modular (Train) – Score: 3

C (0), M(1), L(0) – Score: 1

Final Score: 6

Making healthcare options available to the underserved population is the lifeline express main goal. Each trip they take to a remote location is treated as a project. These initiatives provide high-quality healthcare to Indians who have difficulty accessing it. This can be done using a means of transportation whose design is ideal for reaching to isolated locations swiftly and easily without being hindered by road traffic. On trains with rail lines installed for the public's access to particular regions, this shape is accomplished. So why not use the same principles to expanding access to healthcare? So, form comes after function.



Motor Bike, Chattisgarh

Form follows Function – System
 Form follows Function – Sub-systems
 Score: 2

Standard and Tailored (Bike) – Score: 4

C (0), M(0), L(1) -Score: 1

Final Score: 7

Motorcycle ambulances have been found to effectively reduce the duration required for the transportation of pregnant women experiencing obstetric complications from remote rural health centers to the district hospital. This is particularly beneficial in cases where these health facilities are devoid of alternative means of transportation or lack a means to request an ambulance via telephone communication. Additionally, they are a reasonably priced and practical choice for patients in underdeveloped nations, especially in remote places with scant or no public transportation. However, as it is somewhat exposed on the sides, the feeling of safety is diminished here. If the patient needs a family member to accompany him or her for care, it will not be possible because it can only transport one person at a time. Thus, shape does not necessarily follow function.



Veterinary Mobile Clinic, Virginia

Function follows Form – System
 Function follows Form – Sub-systems
 Score: 2

Standard (Bus) – Score: 1

C (0), M(1), L(0) – Score: 1

Final Score: 4

The bus is deployed to residential areas in order to provide medical care to pets and facilitate their transportation to veterinary facilities. Due to a lack of conscientiousness among certain pet owners, there are instances where they neglect to seek medical attention for their animals when they are unwell or fail to schedule routine check-ups. Hence, the utilization of a bus, which possesses ample capacity to accommodate the requisite equipment, would effectively address the challenge pertaining to both accessibility and storage. According to conventional wisdom,



Mobile Surgery Unit, USA

Function follows Form – System
 Function follows Form – Sub-systems
 Score: **2**

Standard and Tailored (Truck) – Score: **3**

C (0), M(0), L(0) – Score: **0**

Final Score: **5**

the concept of form follows that of function.

These mobile surgery units are self-contained, durable, and customizable to client needs. Mobile surgical unit employees must rapidly and easily switch equipment and supplies to meet diverse surgeries. It can be erected, relocated, and modified for multiple work environments, so it may be used almost anywhere in a healthcare facility. This improves efficiency, hygiene, and labor. Wheeled storage cabinets are easy to transport. Hospital workers can stock what they need for a surgery in an off-area, roll the units into the operating room, then roll them out to reload for the next procedure. Hospitals appreciate color-coding drawers to rapidly find what they need. Form follows function.



SNEHA mobile clinic, India

Function follows Form – System
 Function follows Form – Sub-systems
 Score: **2**

Standard and Tailored (Bus) – Score: **3**

C (0), M(1), L(0) – Score: **1**

Final Score: **6**

The SNEHA mobile clinic vehicle delivers preventative and promotional healthcare to underprivileged groups in Kalyan and Dombivali Municipal Corporations' underserved informal settlements. This bus serves as a platform to raise public awareness of health issues such pre-natal and post-natal care, nutrition, family planning, TB, malaria, and dengue, as well as to inspire communities to demand effective medical care. As and when necessary, patients are directed to both public and private institutions. Many underprivileged individuals found use for this bus.



Last Mile Health, Liberia


Function follows Form – System
 Function follows Form – Sub-systems
 Score: **2**

Standard (Bike) – Score: **1**

C (0), M(0), L(1) – Score: **1**

Final Score: **4**

Healthcare professionals can enhance healthcare coverage and enhance accessibility for their specific populations by equipping riders with motorcycles and providing them with the requisite training and maintenance. The riders provide supplementary support services, including supply chain distribution, diagnostic sample transport, and emergency medical transportation. In the context of design, it is commonly understood that form follows function.

	<p>Form follows Function – System Form follows Function – Sub-systems Score: 2</p> <p>Tailored (Bus) – Score: 2</p> <p>C (0), M(1), L(0) – Score: 1</p> <p>Final Score: 5</p>	<p>The objective of this mobile health clinic is to provide medical services to underserved and poorly coordinated areas in outlying locations. The aforementioned locations lack expansive roadways. The condition of the road infrastructure is substandard. This gives rise to several challenges, such as the incapacity to execute a U-turn, negotiate a sharp turn, or maneuver within confined spaces. Ultimately, it fails to reach its intended destination. Consequently, the relationship between shape and function exhibits only partial alignment.</p>
<p>Mobile telemedicine System, Lucknow</p>		

Group 1 analyzed the case study enlisted in Table 1 into three themes as factors for form, factors for function and the verdict about form follows function? Following section will describe some case studies apart from what have been discussed in Table 1 and highlight other aspects to draw insights.

Mobile clinic on a boat (Sunderbans) utilizes a boat as a mode of transport due to the lack of road accessibility in the Sunderbans region. The clinic is designed to suit water and marshy lands, providing clinical activities on the first deck and living quarters on the upper deck. The 24-meter amazon mobile health clinic features a two-storey design. The first deck houses clinical activity, including doctor, nurse, and dentist offices, a pharmacy, laboratory, immunization, and sterilization facilities. The team's bedrooms, kitchen, and office are upstairs. Community workers help plan Igaracu trips and connect the clinic to the community. Under a nurse supervision, they create patient tracking maps for pregnant women, children, and individuals with chronic diseases who need specific assistance. (Michele et al., 2017). Floating clinic on a boat (Nigeria) serves first aid, medical emergency care, and basic healthcare services in remote riverine communities and areas of Lagos state. The boat is a closed rectangular structure equipped with medical clinic equipment and safety measures (Maureen Ogolor, 2022).

Lifeline express (rural region) is a retrofitted train that brings healthcare services, including basic healthcare and surgical units, to rural areas with limited access to healthcare facilities. The train's arrival is preceded by a medical team's visit to assess the local healthcare needs (Ahmed et al., 2020). Motor-bike ambulance are modified motorcycles with side-carriages serve as ambulances to overcome transportation challenges in regions with difficult topography. Skilled drivers operate these ambulances, which are equipped with first-aid supplies and serve areas with government-supported medical stalls (Bill Wood, 1984). Mobile clinics for animal care provide neuter (spay) services to underserved neighborhoods. Mobile clinics travel to different locations, offering surgical services and transportation assistance to residents who lack means of transportation (No Author, n.d.-w). Mobile Surgical Unit (MSU) are custom-designed semi-truck trailers that expand to over 1,000 square feet, catering to various medical needs. These units are versatile, easily configurable, and suitable for immediate care facilities in disaster areas and war zones (Miller, 2009).



Medical bus contains different compartments for medical units, including an x-ray unit, control unit, and general check-up unit. It is designed for efficient space utilization and accessibility, with separate entrances and sufficient ventilation. Medical bike for remote areas is equipped with storage spaces, this bike serves to transport personnel and medicines to remote areas. Community health workers are trained and equipped with diagnostic tools and medication to provide point-of-care services (van Niekerk L, 2017). Lucknow telemedicine bus having different compartments with each compartment serving a different purpose. One is an x-ray unit; one is a control unit and another is a general check-up unit. Its electrical devices take electricity from the generator which is externally kept in the bus. It is built such that the person enters and exits from different gates. A unit where online doctors can be consulted, a general check-up space, control room, speakers for hearing online conversations are available. A device which could measure general things like blood pressure, oxygen saturation, etc., along with modular furniture to optimize space are also present (Kapoor et al., 2005).

Various innovative mobile healthcare designs cater to different contexts, such as boats for water-based regions, trains for rural areas, and motorcycles for difficult terrains. These mobile clinics often feature specialized

compartments or decks to accommodate medical facilities, living quarters for staff, and diagnostic equipment, ensuring comprehensive healthcare services are provided on-the-go. The mobile clinics cater not only to human healthcare but also to animal care, with spay services being provided to underserved neighborhoods. The versatility and adaptability of mobile healthcare units are evident in custom-designed semi-truck trailers that can expand to serve immediate care facilities in disaster areas and war zones. Mobile clinics leverage technology, with telemedicine buses offering online doctor consultations and equipped with diagnostic tools for point-of-care services. The design considerations include efficient space utilization, separate entrances for different units, sufficient ventilation, and modular furniture to optimize space. Community involvement and support play a vital role in connecting mobile clinics to the communities they serve, ensuring effective healthcare delivery and continuity.

These case studies show the many strategies used to deal with healthcare issues in off-the-grid and underserved locations. In order to effectively deliver healthcare services to populations without convenient access to traditional healthcare infrastructure, they emphasize the significance of taking form and function considerations into account when constructing mobile healthcare facilities.

Table 2. Mobile Clinics (Credit: Authors Own)

Study case	Form - Standard, Tailored, Collapsible Function - Collapsibility (C), Modularity (M), Lightweight(L)	Form follows Function?
 <p>Hospitainer, Germany</p>	<p>Form follows Function – System Form follows Function – Sub-systems Score: 2</p> <p>Standard and Tailored (Truck) – Score: 3</p> <p>C (0), M (1), L (0) – Score: 1</p> <p>Final Score: 6</p>	<p>Once this truck is fixed, all the other functions of positioning the entry, arranging the storage within, situating the examination area, etc., circle around the container and are integrated into it. Form follows function and function follows form as well.</p>
 <p>Smile on Wheels, India</p>	<p>Function follows Form – System Function follows Form – Sub-systems Score: 2</p> <p>Standard and Tailored (Van) – Score: 3</p> <p>C (0), M (1), L (0) – Score: 1</p> <p>Final Score: 6</p>	<p>The function-form fit is inadequate. Given that these vehicles were utilized as emergency ambulances, individuals were acquainted with their usage for transportation needs. Nevertheless, upon careful examination, it becomes evident that the significant discrepancy in expertise between medical practitioners and individuals seeking healthcare engenders considerable distress.</p>



Kaiser Mobile Health vehicle

Form follows Function – System
 Form follows Function – Sub-systems
 Score: **2**

Standard and Tailored (Truck) – Score: **2**

C (0), M (1), L (0) – Score: **1**

Final Score: **5**

Kaiser Permanente's health clinic exemplifies "form follows function". Patients can choose which exam room to visit from the entry path. The car meets urban needs because most customers are urban. As shown, the space above the driver's cabin is used as a storage compartment with no further adornment. The clinic is a plain rectangular box with two opposed windows and an entrance. It fits three doctors and two tables. The carriage vehicle has a simple driving part and a platform for clinics. Clinics are rectangular boxes. Citizens cannot enter the clinic or interact with the doctor and nurse.



Mobile Trailers

Form follows Function – System
 Form follows Function – Sub-systems
 Score: **2**

Standard and Tailored (Truck) – Score: **2**

C (0), M (1), L (0) – Score: **1**

Final Score: **5**

Form follows function. The carriage and clinic's modest design conveys the need that would have helped develop the product. People chose basic, quick-to-make items during Covid-19. No ornamentation, aerodynamic curves, or other such features support the claim.



Mortuary mobile health vehicle, Turkey

Form follows Function – System
 Form follows Function – Sub-systems
 Score: **2**

Standard and Tailored (Truck) – Score: **3**

C (0), M (1), L (0) – Score: **1**

Final Score: **6**

Form follows function. The deceased's body is stored in a refrigerated morgue unit for preservation and safekeeping. The conservation of energy can be achieved by exclusively utilizing the body cell's engine for cooling purposes, particularly when operating at a temperature of -20 degrees Celsius (optional). The Frigo Frig funeral washing tool is designed to facilitate the washing of the deceased in a designated location, in accordance with established funeral practices and standards of hygiene. The morgue unit is cooled to a temperature of zero degrees Celsius. The digital display exhibits the process of cooling. The funeral washing table is constructed using 304 stainless steels.



Surgical Emergency Mobile Health Vehicle BMW 525 Touring, Germany

Function follows Form – System
Function follows Form – Sub-systems
Score: **2**

Standard (Car) – Score: **1**

C (0), M (0), L (0) – Score: **0**

Final Score: **3**

This BMW 525 Touring's front paint scheme follows North Rhine-Westphalia's rescue vehicle color guide. Road visibility and emergency scene parking are good with the rear color scheme. Medical and technical devices on a solid panel. Rescue tools are stored below the panel. The radio and emergency lights system controls are neatly arranged on the dashboard.



Laboratory Mobile Health vehicle, China

Form follows Function – System
Form follows Function – Sub-systems
Score: **2**

Standard and Tailored (Truck) – Score: **2**

C (0), M (1), L (0) – Score: **1**

Final Score: **5**

The vehicle limit's function placement here. It must be designed within a rectangle. However, the designer or manufacturer chose it because to the extended medical treatment needed. This huge container vehicle and its interior layout may have been chosen for that. All-in-one molecular diagnosis at Point of Care Testing (POCT) enables truly on-site PCR with speedy, portable, and user-friendly molecular testing that greatly enhances an effective large-scale implementation with attainable goals of "early detection, early diagnosis, early treatment, and early isolation" in the front line of the epidemic. Fast & Easy: Innovative user-friendly design simplifies operation, enabling decentralized on-site testing.



Ranger Mobile Clinic

Form follows Function – System
Form follows Function – Sub-systems
Score: **2**

Standard and Tailored (Bike) – Score: **4**

C (0), M (0), L (1) -Score: **1**

Final Score: **7**

Form is function-based because 2-wheelers are affordable and easy to access. The bed, medicine, and equipment storage took their own space based on functional feasibility, and the form is based on its placing. Form follows function. The Ranger Production Company created the eRanger Mobile Immunization Clinic Unit to provide primary care to distant areas. The eRanger Immunization/Clinic unit is developed for rural primary health care and contains various features that help local medical professionals run clinics in remote places.



Mahindra Bolero

Function follows Form –
System

Function follows Form –
Sub-systems

Score: **2**

Standard (SUV) – Score:
1

C (0), M (0), L (0) – Score:
0

Final Score: **3**

The SUV vehicle is easier to maneuver in mountainous locations with many tiny radius curves due to its modest size and compactness. It's also eco-friendly because of its spare parts availability and ecosystem. Such jeeps are used in hilly areas because form follows function. The jeep's design limits its storage and facilities functions.

Group 2 analyzed various case studies of mobile clinics, both custom-designed and retrofit on vehicles (Table 2). The first case study focuses on the Hospitainer, a 15-foot custom-made clinic built on a mini truck platform. The clinic is contained within a container that fits the truck's platform, providing ease of transportation. The design is minimalistic, prioritizing function over ornamentation. Smile on wheel foundation operates mobile vans equipped with medical facilities, including oxygen cylinders, nebulizers, and electrocardiogram machines. These vans serve as mobile hospitals and retain the original van form with slight modifications in the interior layout to accommodate medical requirements (Majumdar, 2017). The Kaiser mobile health vehicle is a 40-foot long truck primarily designed for urban areas with ample space for healthcare facilities. It features three major compartments, including two exam rooms and a driver's cabin, with patient entry situated between the two rooms. Morgue unit for funeral storage is installed in the interior of the frigo frig safe in desired dimensions. Frigo frig funeral washing tool is designed for washing the funeral in a desired place in accordance with the funeral and respectful hygienic rules. BMW 525 touring is a mobile health module carrying basic amenities to provide basic healthcare services. The Mobile Lab accommodates the equipment for rapid and high-throughput tests, with capacities to complete high-throughput and rapid on-site tests. Single cabinet design, free of disassembly or debugging and highly maneuverability is some of the features. eRanger with various characteristics that are advantageous to local medical professionals and improve their capacity to conduct primary care clinics in isolated rural settings. The eRanger immunization unit has been specifically created for primary health care in rural areas. The last case study describes the Mahindra Bolero, which includes point-of-care diagnostics, diagnostic equipment such as x-ray and ultrasound machines, sterilization equipment, personal protective equipment, medications, and emergency supplies. It is equipped with integrated solar power and partitions for privacy.

Key takeaways from the case studies of mobile clinics are design prioritization which states that many mobile clinics prioritize function over ornamentation, resulting in minimalistic and practical designs to serve specific healthcare needs effectively. Versatility and adaptability of mobile clinics as they are designed to be adaptable to different environments and regions, catering to remote and underserved areas with limited access to healthcare facilities. Customization as some mobile clinics is custom-built to suit specific requirements, with features like compactness, maneuverability, and eco-friendliness tailored to their intended use. The interior layout of mobile clinics is carefully planned to accommodate medical equipment, storage, and patient examination areas efficiently.

Mobile clinics may have varying designs depending on whether they primarily serve urban or rural areas, considering factors like available space and patient entry points. On-site testing as some mobile clinics is equipped with advanced diagnostic equipment for on-site testing, enabling quick and effective medical assessments. Transportation ease as mobile clinics are often designed to fit the transportation platform, such as trucks, vans, or trailers, ensuring ease of movement to reach different locations. Specialty Services as certain mobile clinics cater to specific healthcare needs, such as morgue units for funeral storage or mobile labs for rapid and high-throughput tests.

Overall, the case studies highlight the innovative designs and functionalities of mobile clinics, emphasizing the importance of meeting healthcare demands in diverse and challenging settings. These studies illustrate the wide variety of mobile clinics that exist, from purpose-built units on trucks to retrofit clinics within pre-existing vehicles, all of which are geared to provide individualized medical care.

Table 3. Mobile Clinics (Credit: Authors Own)

Study case	Form - Standard, Tailored, Collapsible Function - Collapsibility (C), Modularity (M), Lightweight(L)	Form follows Function?
 <p>Camp Moria PHC Unit, Lesbos</p>	<p>Form follows Function – System Form follows Function – Sub-systems Score: 2</p> <p>Standard and Tailored (Truck) – Score: 2</p> <p>C (0), M (1), L (0) – Score: 1</p> <p>Final Score: 5</p>	<p>Medical-grade 20ft containers hold them. However, a 40ft container was turned into a fully equipped PHC unit. AC, air- and water-filtration, drinking and wastewater tanks, and important equipment like examination tables and lamps were included. However, the container's increased capacity allows for an additional examination room to treat more people. A huge, wheeled container. Camp Moria needs a mobile clinic. Since there is no infrastructure, it must survive weather. The container was needed to check a significant number of refugees every day. The diagnostic section provides orthopedic diagnostics, TB screening, and many labs testing. Patients access the mobile diagnostic unit through a waiting area or small office, which provides entry to the X-ray room and laboratory. The X-ray room consists of essential components such as X-ray equipment, Picture Archiving and Communication System (PACS), and a compact changing room equipped with curtains.</p>
 <p>Hospitainer, Sudan</p>	<p>Form follows Function – System Form follows Function – Sub-systems Score: 2</p> <p>Standard and Tailored (Truck) – Score: 3</p> <p>C (0), M (1), L (0) – Score: 1</p> <p>Final Score: 6</p>	<p>Mobile PHCs having vehicle bases at a particular height for ground clearance. This medical facility requires a ladder to enter and exit. A ladder like the one seen above can be hoisted and slipped into the truck instead. Thus, ladder form follows ladder function. But different stakeholders need to access these ladders, and many may have trouble getting up due to old age or injury, so the hand rail in the top image is used, proving that form follows function. The rear entrance platform features a double-fold platform that may rise to the clinic level for patient reception and briefing. The same platform folds under the truck when it moves. Thus, its</p>



Nevada Children Health Unit, USA

Form follows Function
 – System
 Form follows Function
 – Sub-systems
 Score: **2**

Tailored (Bus) – Score: **2**

C (0), M (1), L (0) –
 Score: **1**

Final Score: **5**

flat design with split mechanism matches its function.

Provides care for newborns, children, and teens up to the age of 21, as well as a specific focus on the homeless, the disenfranchised, and those who are suffering poverty are the key services given by Nevada children Health Unit. Serves youth in southern Nevada who are considered to be at risk.



Inflatable Field Hospital

Form follows Function
 – System
 Form follows Function
 – Sub-systems
 Score: **2**

Standard, Tailored and Collapsible (Tent) –
 Score: **6**

C (1), M (1), L (1) –
 Score: **3**

Final Score: **11**

Inflatable field hospital is the only collapsible design for a primary health center. Pumping the air inside will raise the tent. It takes on the desired structural shape once inflated. It collapses as the air is let out, making it portable and packable. The entrance side has a rectangular base and a heptagonal form. The large base provides stability and support for the structure. The heptagonal roof structure's sloped design makes it ideal for all weather conditions. Camps that are quick to create and disassemble. Single structure that is portable and lightweight and does not require several parts to assemble.



SEGALURG, a mobile hospital between France and Spain

Form follows Function
 – System
 Form follows Function
 – Sub-systems
 Score: **2**

Tailored (Container Box)
 – Score: **2**

C (0), M (1), L (0) –
 Score: **1**

Final Score: **5**

SEGALURG project's major goal is to offer full hospital services between France and Spain, not just basic healthcare. Up to 12 foldable containers with various uses can be accommodated by this design. Its layout was made to accommodate many people, and during the Covid 19 era, this kind of mobile healthcare service proved to be particularly useful in areas without access to adequate medical facilities. This design embodies the adage "form follows function" because it can accommodate numerous patients at once and offer a wide range of medical services.



Off road mPHC

Form follows Function
 – System
 Form follows Function
 – Sub-systems
 Score: 2

Tailored (Truck) –
 Score: 2

C (0), M (1), L (0) –
 Score: 1

Final Score: 5

Offroad mPHC vehicle is built so that primary healthcare services can be delivered to desert and mountainous regions with poor access to highways. The container is also kind of formed like a dome to provide the vehicle stability, and the inside design is retained in such a way that off-roading does not impact the vehicle's general movement. Overall, this car is built to fulfill a specific function. This design complies with the adage "form follows function" because both its exterior and interior have been created to work in both mountainous and desert terrain.



Zeppelin, Germany

Form follows Function
 – System
 Form follows Function
 – Sub-systems
 Score: 2

Tailored (Container Box)
 – Score: 2

C (0), M (1), L (0) –
 Score: 1

Final Score: 5

Zeppelin's one container may be expanded to become three containers, each of which can be utilized for a different function. This unique sort of collapsible mobile medical unit was developed in Germany. In Germany, it is typically utilized in outlying places where it is challenging to enter a huge truck, making this kind of construction particularly practical. Because of its use case, this design abides with the adage "form follows function". Because it can hold a lot of medical equipment, its design sets it apart from other hospital vessels.



Table 3 discusses another set of mobile clinics with applications and potentials. Camp Moria is a Greek camp on the island of Lesbos, designed to accommodate migrants and refugees in need of shelter. The Hospitainer primary healthcare unit in Sudan focuses on providing general healthcare services, with specific equipment and examination tables tailored to its purpose. A blue trailer converted into a medical facility serves as a mobile clinic, offering free exams, referrals, medication, and lab testing to uninsured or Medicaid-covered children and young adults. In emergency situations, inflatable (collapsible) field hospitals are deployed quickly due to their portability, ease of use, and lightweight nature. A unique mobile and autonomous care unit, capable of handling 18 patients, can be set up within an hour and aims to improve emergency and disaster response. The off-road mobile clinic is designed for challenging terrains, offering a fully weatherproof and modular environment for various medical treatments. The master-shelter includes a detachable unit, providing additional space when needed, and offers high-quality and versatile specialist practices. From emergency situations to providing primary care in refugee camps, these mobile clinics can adapt to a wide variety of situations and patient demands.

Mobile clinics often utilize repurposed shipping containers, which offer a compact and easily transportable base for medical facilities. Functionality and flexibility are essential in mobile clinic designs, enabling them to adapt to various environments and medical needs. Many mobile clinics prioritize basic healthcare services, diagnostic capabilities, and emergency response to cater to underserved populations and disaster situations. The form of mobile clinics is often influenced by their intended functions, such as compact designs for off-road travel or collapsible structures for quick deployment. Some mobile clinics focus on specific target groups, like youth at risk or homeless populations, addressing their unique healthcare needs. Inflatable and collapsible field hospitals offer rapid and portable solutions in emergency situations, showcasing the importance of adaptability and ease of use. Mobile clinics play a crucial role in providing medical care in remote and challenging regions, filling gaps in healthcare

access for vulnerable communities and refugees. Modular designs that allow for expansion and customization are beneficial for accommodating various medical equipment and services in mobile clinics.

These case studies highlight the diverse applications and potentials of mobile clinics, showcasing their critical role in extending healthcare services to populations in need, even in the most challenging and remote environments.

Table 4. Mobile Clinics (Credit: Authors Own)

Study case	Form - Standard, Tailored, Collapsible Function - Collapsibility (C), Modularity (M), Lightweight(L)	Form follows Function?
 LYNK Ambupod Pvt. Ltd	Form follows Function – System Form follows Function – Sub-systems Score: 2 Standard and Tailored (Bike) – Score: 4 C (0), M (0), L (0) – Score: 0 Final Score: 6	The design of the Ambupod ambulance was significantly influenced by a fighter plane. Ambupod is built with a construction that allows it to securely carry patients while navigating through tight spaces in busy traffic and even running on the sidewalk. With the aid of towing arms, it may be attached to any type of vehicle, including a bike, scooter, etc. Due to its minimal weight, it can even be airlifted in an emergency. Given its size and design, the Ambupod can also avoid urban traffic and requires no fuel to operate. Since everything is solar- or battery-powered. Ambupod's primary goal is to improve accessibility for patients in remote areas who now have very limited access to healthcare services. It offers all necessary healthcare services in a single location, is environmentally friendly, inexpensive, and low-maintenance, and offers simple maneuverability because to its structural design. As a result, form in this instance follows function.
 JAYO BS6 MMU, Mahindra	Form follows Function – System Form follows Function – Sub-systems Score: 2 Standard and Tailored (Truck) – Score: 3 C (0), M (1), L (0) – Score: 1 Final Score: 6	JAYO BS6 is a little car that is simple to maneuver in crowded cities, shantytowns, and rural locations. large enough to fit all equipment types in the patient compartment. Given the shape of the truck, it offers a more comfortable ride. Better mileage and lower running expenses. An increased volumetric capacity for the MMU compartment results from a lighter chassis. A bigger MMU Compartment is ideal for a longer chassis length. Given that it is intended to be utilized in slums, suburbs, and certain rural regions, its mobility and small form provide it an advantage over other heavier vehicles or truck-based MMUs. So, form comes after



Mobile Health Clinic 36FW

Form follows Function
– System
Form follows Function
– Sub-systems
Score: **2**

Tailored (Container Box)
– Score: **2**

C (0), M (1), L (0) –
Score: **1**

Final Score: **5**

function.

36FW mobile clinic that may be customized according to the needs of the healthcare system is known as an expandable trailer-based clinic. Any vehicle can be used to tow a mobile health clinic that operates from a trailer around the city. With expandable and modular modules, the trailer-based clinic is simple to set up after it has been placed in a suitable location. The extensible trailer-based clinic is quickly ready for use and has the highest level of space efficiency. It is now incredibly simple and affordable to guarantee continuity in medical services thanks to the extendable trailer clinic, which can be used with ease in any terrain and environment. As a result, form comes after function.



Helicopter Emergency Medical Service, ICCATT

Function follows Form
– System
Function follows Form
– Sub-systems
Score: **2**

Standard (Helicopter) –
Score: **1**

C (0), M (0), L (0) –
Score: **0**

Final Score: **3**

In the event of a medical emergency that poses a significant risk to the individual's life, the affected individual is expeditiously transported to the closest medical facility. Once the hospital acknowledges its inability to address the issue, the individual is referred to a tertiary center. The majority of fatalities can be attributed to either of these two expeditions or the initial hospital where patients are admitted. The practice is disrupted by HEMS. Helicopters facilitate the transportation of highly skilled intensive care and emergency physicians to top-tier tertiary care medical facilities, thereby ensuring prompt and efficient access to state-of-the-art intensive care units. This intervention has effectively mitigated avoidable fatalities. During significant calamities such as train accidents and natural disasters, Helicopter Emergency Medical Services (HEMS) establish triage and temporary treatment facilities, facilitating the prompt and efficient transportation of numerous personnel and equipment. The utilization of Helicopter Emergency Medical Services (HEMS) is considered optimal for responding to medical emergencies due to its superior speed in reaching the scene.



Mobile 1000, Wockhardt Foundation, Life wins

Function follows Form
 – System
 Function follows Form
 – Sub-systems
 Score: **2**

Standard and Tailored
 (Van)
 – Score: **3**

C (0), M (1), L (0) –
 Score: **1**

Final Score: **6**

The Mobile 1000 health van is equipped with a GPS monitoring device and staffed by a doctor, pharmacist, and driver. This mobile unit offers complimentary outpatient department (OPD) consultations, health screenings, and essential healthcare services in underserved rural regions. The organization provides education to rural communities regarding various health-related topics including sanitation, cleanliness, maternal and child healthcare, access to safe drinking water, immunization, anemia prevention, deworming, vector-borne diseases, HIV prevention, snake bites, diabetes management, and tuberculosis awareness. Treatment follows diagnosis. Specialists treat specific cases. Health awareness IEC (Information, Education, and Communication) material is given in the regional language. Vans can go deeper into communities with narrower roads than buses, so they can treat more patients. A doctor and patient can share a medical van. "Form follows function" for these reasons.



Bike mobile medical unit, Hero

Form follows Function
 – System
 Form follows Function
 – Sub-systems
 Score: **2**

Standard and Tailored
 (Bike) – Score: **4**

C (0), M (0), L (1) -
 Score: **1**

Final Score: **7**

Bike MMU Half-flat, half-curved design allows patients to lay down safely. Side handles support. Patient first aid comprises oxygen cylinder and box storage. Still looks like a transportation vehicle with tyres and front lights for night driving, but uses ambulance design language (material, color, lettering, blue light). Thus, bike ambulances have a functional vehicle attached to a typical bike. Thus, bike ambulance follows form follows function. However, this ambulance has static functions. Thus, it follows the idea yet is unusable and undesirable. Miniaturization and multifunctionality are needed to boost product output while decreasing space.



Function follows Form
 – System
 Function follows Form
 – Sub-systems
 Score: **2**

Standard (Airplane) –
 Score: **1**

The Orbis flying hospital's modular rooms maximize efficiency by adding services and equipment in a limited space. The foot area has strategically positioned rooms. A 46-seat classroom educates pupils. A big commercial jet turned into an eye hospital and teaching institute may cruise the world. Considering that a world-class healthcare unit with a


<p>The Orbis Flying Eye Hospital, Orbis and Geoff Oliver Bugbee</p>	<p>C (0), M (0), L (0) – Score: 0</p>	<p>general check-up, laser treatment, recovery space, and 46-seat classroom can be made available worldwide. Function precedes form.</p>
	<p>Final Score: 3 Form follows Function – System Form follows Function – Sub-systems Score: 2</p>	<p>Bus MMU components function individually in their space. They also help the integrated medical system. They interact based on functional needs (oxygen masks hang from the wall over the bed so the patient can reach them). Walls allow floor space to breathe. The layout meets medical unit needs. Patients and accomplices must sit and lie down. This requires beds on the bus's edges and space in the middle. The sink and machinery are on the other side of the bus, causing need-based segregation. Functions determine internal arrangement. Form follows function. It resembles a Volvo-sized bus. Bus speed and penetration are limited by size. It may be parked in a park or playground for users to utilize. It cannot travel on streets, minor roads, or distant hills. Thus, form overrides medical unit function. Thus, shape does not follow function.</p>
<p>Bus mobile Clinic, EMS Mobil Stemler, Turkey</p>	<p>Tailored (Bus) – Score: 2 C (0), M (1), L (0) – Score: 1 Final Score: 5</p>	<p>The layout meets medical unit needs. Patients and accomplices must sit and lie down. This requires beds on the bus's edges and space in the middle. The sink and machinery are on the other side of the bus, causing need-based segregation. Functions determine internal arrangement. Form follows function. It resembles a Volvo-sized bus. Bus speed and penetration are limited by size. It may be parked in a park or playground for users to utilize. It cannot travel on streets, minor roads, or distant hills. Thus, form overrides medical unit function. Thus, shape does not follow function.</p>



Table 4 contains a wide variety of mobile clinics from bike to airplanes. The Ambupod is a micro ambulance equipped with medical equipment and telemedicine capabilities, serving as a 24/7 clinic in remote villages. It is designed to reach rural areas with its portable and lightweight structure (Lavanian, 2016). The Mahindra mobile clinic provides enough space for attendants and equipment, serving as a small clinic on wheels. The trailer-based mobile hospital is a versatile unit that can be easily transported and adapted to different clinics, offering cost-effectiveness and self-sufficiency. Air ambulance services utilize helicopters or fixed-wing aircraft converted into flying intensive care units for the transfer of critically ill patients and organs. The Mobile1000 medical vans deliver primary healthcare services, focusing on excellence and accessibility. Different materials like aluminum pipes, metal sheets, and plastic are used in the construction of mobile healthcare units, providing a sturdy appearance. The flying eye hospital by Orbis is a unique plane that travels to different countries, providing hands-on training and lectures to ophthalmic professionals to combat avoidable blindness. The mobile units offer sufficient space for users to sit, lie down, and be comfortable, with proper equipment placement and a balance between positive and negative space.

The key takeaways from the above case studies are that Ambupod and Mahindra mobile clinics demonstrate form follows function by prioritizing maneuverability, lightweight structure, and efficient use of space to reach remote villages and provide primary healthcare services. The expandable trailer-based clinic and the flying eye hospital prioritize function over form, focusing on adaptability, self-sufficiency, and hands-on training for medical professionals. Air ambulance services prioritize speed and efficiency in transporting critically ill patients and organs, highlighting the importance of function over form in emergency medical services. The Mobile1000 medical vans focus on providing essential healthcare services in underserved rural regions, emphasizing the alignment of form with function to meet the needs of patients in diverse communities. The materials used in constructing mobile healthcare units, such as aluminum pipes, metal sheets, and plastic, contribute to their sturdy appearance and functional design. Proper equipment placement and balance between positive and negative space ensure comfort and convenience for patients in mobile healthcare units. These case studies showcase the diverse approaches to

design and functionality in mobile healthcare units, with each unit prioritizing different aspects based on the specific needs and goals of the healthcare services they provide.

In summary, these mobile healthcare units prioritize accessibility, versatility, and functionality, aiming to reach remote areas, deliver primary healthcare services, provide specialized medical care, and combat avoidable blindness.

Table 5. Mobile Clinics (Credit: Authors Own)

Study case	Form - Standard, Tailored, Collapsible Function - Collapsibility (C), Modularity (M), Lightweight(L)	Form follows Function?
 Crestline Coach Medical Health Centre, Toronto	Form follows Function – System Form follows Function – Sub-systems Score: 2 Tailored (Truck) – Score: 2 C (0), M (1), L (0) – Score: 1 Final Score: 5	Crestline Coach MHC is a specially designed mobile health clinic in Toronto. This program's goal is to assist local patients in resolving some of their healthcare issues before they develop into true crises. Community paramedics aim to fill the gap between acute care and primary healthcare and to assist those who are not receiving assistance from anyone else in the neighborhood and are therefore largely reliant on emergency services to receive the necessary routine care.
 Mobile Health Clinic, Regenbogen India Foundation	Function follows Form – System Function follows Form – Sub-systems Score: 2 Standard (SUV) – Score: 1 C (0), M (0), L (0) – Score: 0 Final Score: 3	The Mobile Medical Clinic transports a doctor, two nurses, a pharmacist, driver, social worker, and assistant to villages. Modern clinics have nursing, doctor, and pharmacy rooms. Its water tanks, oxygen cylinder, refrigerator, and medicine store are air-conditioned. The mobile clinic visits distant Tiruvannamalai and Chengam villages three days a week. The squad jeeps to Jawadhu Hills twice a week.



40 ft mobile dental clinic

Form follows
Function – System
Form follows
Function – Sub-
systems
Score: 2

Tailored (Truck) –
Score: 2

C (0), M (1), L (0) –
Score: 1

Final Score: 5

40-foot dental clinic built to order has a reception space and bathroom. La Boit Specialty Vehicles provides the 40ft Mobile Dental Clinic with up to three private exam rooms and a separate reception space. The vehicle has three dental suites. The largest dental bus, measuring 40 feet, has three examination rooms. It is a mobile dental clinic with all the amenities.



Mobile clinics on camel, Africa

Function follows
Form – System
Function follows
Form – Sub-systems
Score: 2

Standard (Camel) –
Score: 1

C (0), M (0), L (0) –
Score: 0

Final Score: 3

Camel mobile clinics is a unique instance of bringing essential medical infrastructure to remote areas utilizing native animals. Family planning services and other medical supplies are delivered to isolated villages via a mobile clinic on legs. Seven guys wearing vivid yellow T-shirts, three nurses, and thirteen camels saunter across the barren, parched countryside. The camels are carrying trunks filled with family planning supplies, bandages, and medications. It is a mobile medical facility that is equipped with the necessary resources and is capable of transportation. Individuals of various genders and age groups assemble in an orderly manner upon the arrival of the camels at the designated site. They patiently await the handlers' assistance in unloading the boxes and setting up the tables and tents.



Turton Bodies Limited, Britain

Form follows
Function – System
Form follows
Function – Sub-
systems
Score: 2

Tailored (Truck) –
Score: 2

C (0), M (1), L (0) –
Score: 1

British eye clinics are large column bespoke vehicles. The mobile eye clinic has a large, heated waiting room with bench seating and a full-length canopy to protect the entrance and ramp. The waiting room leads to an eye clinic with storage, heating, sinks with hot and cold water, and a wall-mounted eye test screen. The roomy clinic fit out included a height-adjustable equipment table. LED lights under the canopy make this mobile clinic vehicle beautiful and functional in


	<p>Final Score: 5</p>	<p>winter. The huge ramp with matching railings has its own locker at the front of the mobile clinic, and the components separate and slide into their storage compartment. The clinic section had a rear access door so employees could exit without going through the waiting room and store materials for transit in the vehicle while it was closed.</p>
<p>Mobile Clinic, Chad</p>	<p>Function follows Form – System Function follows Form – Sub-systems Score: 2</p> <p>Standard (SUV) – Score: 1</p> <p>C (0), M (0), L (0) – Score: 0</p>	<p>These mobile clinic vans are observed in rural Toronto. To ease patients' heads and legs, the bed cushion is uneven. The windows strategically light the appropriate areas without additional lighting. Diagnostic gadgets are fixed to the bedside wall. This maintains the assembly hierarchy and makes display easy with flexible wires. Form follows function in this design.</p>
<p>Final Score: 3</p>		

Table 5 has six case studies from developing countries like Africa, India and from developed countries like Britain and Canada. Toronto emergency medical community paramedicine program developed in 1999 focuses on non-emergency, community-based services in urban areas. It offers health promotion, injury prevention, vaccinations, infection control, and community referrals. Second case study is a mobile health clinic from India. This mobile clinic provides medical care to villages, reducing suffering, and maintaining the health of parents. It treats over 31,000 patients annually at a low operating cost. Custom-made dental clinic is a 40-foot dental clinic with proper space utilization and equipment allows treatment for multiple patients. It provides storage space for medical reports and medicines. Mobile clinic on legs is efficient in areas with poor road infrastructure, a mobile clinic on legs brings family planning and medical supplies to remote communities (Vitale Ami & Kinuthia Wanjiku, 2021). Mobile clinic in Gloucester has added another mobile clinic vehicle to their fleet, making design changes based on their experience. It serves as a 3,500 kgs category clinic. Due to underfunding and shortages, a large van is used for non-emergency services in rural areas, addressing the healthcare needs of many people at once (Ndikuriyo, 2022).

Key takeaways from the above case studies are that custom-designed mobile clinics cater to specific healthcare needs, such as dental services, eye clinics, and family planning in isolated villages. The use of native animals, such as camels, to transport medical supplies to remote areas showcases innovative approaches to reaching difficult-to-access locations. Mobile clinics in developing countries like India serve a large number of patients, contributing to health promotion and disease prevention with low operating costs. Design considerations for mobile clinics include proper space utilization, equipment storage, patient comfort, and efficient lighting to support medical services. Developed countries also utilize mobile clinics to address healthcare needs in urban and rural areas, adapting their designs based on experience and funding constraints.

These case studies show several methods to mobile healthcare, such as community-based paramedicine, village-focused medical care, specialist dental clinics, remote access solutions, and mobile clinics tailored to specific healthcare requirements.

Conclusion

The study explored several mobile clinics across different parts of the world objectively and subjectively among five focus groups. The results are similar to the hypothesis of the study where we hypothesized that form follows function and vice versa in case of the overall system of mobile clinics. In contrast, when investigating into the sub systems of each mobile clinics we found that, most of the sub systems were designed according to form follows function. For example, two examples which can be compared due to the contrasting stance are Ambupod and Inflatable field hospital. Ambupod has a form and then the functions have been accommodated according to the form whereas for inflatable field hospital, form was designed according to the function to be accommodated inside it. The results are in the form of recommendations providing designers to keep in mind that the percentage of form follows function is less than the function follows form but at the sub system level, form follows function in almost all cases. The limitations were the subjective interpretations which could have been translated into objective interpretations. This was also done because there was no literature, objective parameters to judge any design on form follows function? The results showed that for a complex system like a mobile Primary Health Center (mPHC) where it has several subsystems and constraints of context of use, services and facilities to be provided and number of professionals to be deployed and for number of people the system needs to be deployed factors in. A simpler interpretation of results is that it is better to look for a balance solution of form and function without comprising the top priorities in different context. Second interpretation is that the function follows form in most of the cases. Lastly, in case of designing subsystems, function always follows form.

The case studies on mobile clinics highlight the importance of designing healthcare facilities that prioritize function over form. Mobile clinics are tailored to specific contexts and regions, utilizing various modes of transport, such as boats, trains, motorcycles, and trucks, to reach remote and underserved areas. Customization and adaptability are key features in mobile clinic designs, allowing them to provide comprehensive healthcare services on-the-go. The case studies also emphasize the significance of community involvement and support in connecting mobile clinics to the populations they serve. Mobile healthcare units play a critical role in extending medical care to vulnerable communities, including refugees and those in disaster-stricken areas. They serve a wide range of healthcare needs, from basic primary care to specialized services like dental and eye clinics. The design considerations in mobile clinics include efficient space utilization, proper equipment placement, and the use of materials that ensure durability and functionality. Telemedicine and on-site testing capabilities are incorporated to enhance medical services in remote areas. Furthermore, the design of mobile clinics is influenced by their intended functions, such as compact and collapsible structures for quick deployment during emergencies.

In conclusion, mobile clinics have proven to be versatile and valuable tools in providing healthcare services to diverse and challenging settings. Their designs prioritize meeting healthcare demands in underserved and off-the-grid locations, highlighting the importance of form following function. These case studies offer valuable insights into the innovative approaches taken to address healthcare issues and underscore the need for continuous research and improvements in mobile clinic designs to better serve communities in need. However, it is essential to acknowledge the limitations of subjective interpretations in these studies and suggest further research to explore additional aspects of mobile clinic design and effectiveness.

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Conflict of Interests

The authors declare no conflict of interest.

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