



# Mission Medical Information System



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## What is MMIS?

- Mission Medical Information System
- The evidence base of medical data collected on astronauts before, during, and after space flight. It is a critical supporting element of the Human Research Program. The Longitudinal Study of Astronaut Health (LSAH) was created to make this data available to researchers interested in the effects of space flight on human health.
- The MMIS is designed to facilitate the capture and flow of medical data into a form that the LSAH can easily access.
- In addition, medically relevant data is to be captured in the system (such as number of EVA's, length of mission, etc.).

## MMIS Goals:

- Creation of electronic data interfaces between data sources, such as laboratories, and the MMIS repository. These are being constructed to use Health IT standards such as HL7. Electronic connectors avoid transcription errors and save time.
- Enable structured data capture. The best time to get all the details needed for data is when that data is created. Capturing data in structured form also creates a consistent data structure that significantly aids data analysis.
- Provide tools and resources for structured data management. The use of standard terminologies results in more consistent data analysis, and also enables the comparison of NASA datasets with datasets from other institutions using the same or comparable terminology.
- The MMIS project establishes the system that will continue to be used to collect all medical space flight data.

## Longitudinal Study of Astronaut Health (LSAH):

Clinical Data Repository whose purposes are:

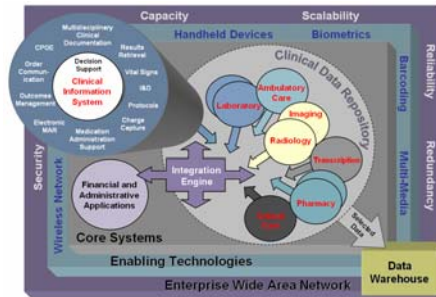
- To examine the mortality and morbidity rates (astronauts versus civil service employees)
- To determine the rate of illnesses and accidents that require medical care
- To facilitate investigations of occupational exposures and health issues in a normal population

Data included is physical exam data from astronauts (active and retired) and comparison subjects

Data Request Process:

- Data requests are sent to the epidemiology section supervisor.
- Extramural data requests must receive initial merit and funding approval via NSBRI or NRA before submission to the LSAH Executive Committee

## Terrestrial Health Information Technology Vision:



## NASA Health Information Technology Needs:

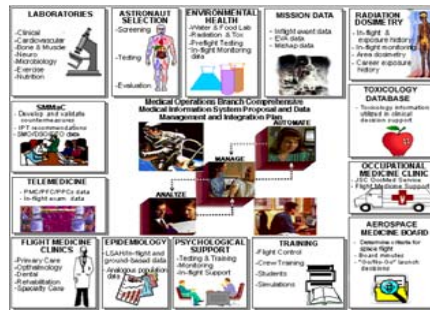
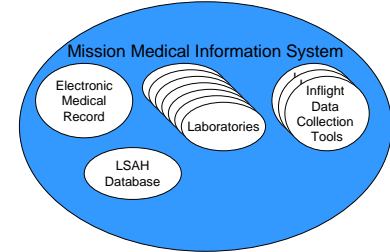


Diagram by Dr. Pat McGinnis

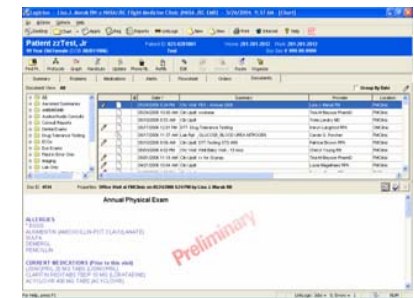
## Methods:

- Adopt terrestrial software solutions where they fit:
  - Use Health IT standards for communications and storage
    - HL7 messaging
    - SNOMED
  - Document data repository contents through data submission agreements
  - Create electronic connectors between laboratories, databases, etc. to facilitate the flow of information.

## Mission Medical Information System Components:



## Electronic Medical Record:



## Data Submission Agreement (example):

| # | Parameter Name                | Parameter Definition  | Field Type | Field Format | Units             | Range | GLD                  | Device                                   | Comments                                 |
|---|-------------------------------|---|------------|--------------|-------------------|-------|----------------------|--|--|
| 1 | Body mass density, whole body | Total bone mineral density of the whole body  | Decimal    | X.XXX        | g/cm <sup>3</sup> | --    | Yes                  | Whole Body DEXA Scan                     | Values only reported for female subjects |
| 2 | T score, whole body           | Whole body T score or z-score for the female subject only. T score refers to the number of standard deviations (SD) above or below the BMC that has been established for the peak bone mass (i.e., young females) for the same sex and gender | Decimal    | XX.X         | --                | Yes   | Whole Body DEXA Scan | Values only reported for female subjects |  |
| 3 | Z score, whole body           | Whole body Z score or z-score for the female subject only. Z score refers to the number of standard deviations (SD) above or below the reference value for the same sex, gender, and age  | Decimal    | XX.X         | --                | Yes   | Whole Body DEXA Scan |  |  |
| 4 | Site ID, whole body           | Alphanumeric string ID generated by the bridge system for the whole body scan   | Text       | XXXXXXXXXXXX | --                | Yes   | Whole Body DEXA Scan |  |  |
| 5 | Site name, whole body         | Text string that the user enters for the whole body DEXA scan   | Decimal    | XXXXXX.E     | g                 | --    | Yes                  | Whole Body DEXA Scan                     |  |
| 6 | Left arm, whole body          | Total mineral density of the left arm from the whole body DEXA scan   | Decimal    | X.XXX        | g/cm <sup>3</sup> | --    | Yes                  | Whole Body DEXA Scan                     |  |
| 7 | Right arm, whole body         | Total mineral density of the right arm from the whole body DEXA scan  | Decimal    | X.XXX        | g/cm <sup>3</sup> | --    | Yes                  | Whole Body DEXA Scan                     |  |
| 8 | Site ID, spine                | Alphanumeric string ID generated by the bridge system   | Text       | XXXXXXXXXXXX | --                | Yes   | Whole Body DEXA Scan |  |  |
| 9 | Site name, spine              | Text string that the user enters for the spine DEXA scan  | Decimal    | X.XXX        | g/cm <sup>3</sup> | --    | Yes                  | Left Hip DEXA Scan                       |  |

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