Technology and Equipment Committee

Radiation Oncology Services - Linear Accelerators

Material Presented by

Southeast Radiation Oncology

At the Linear Accelerator Discussion Group Meeting

on

April 9, 2008

Five Scenarios for Revising ESTV Calculations

Novant Model	2006-07 Procedures	2006-07 ESTVs	% IMRT Energies	With **Revisions** to ESTV Values 2006-07 ESTVs	Change	Percent
CMC	17,957	17,521	20.90%	21,796	4,275	24.40%
CMC-U	9,171	8,395	23.47%	9,960	1,566	18.65%
MROC	12,049	10,803	18.06%	11,117	314	2.91%
Presby	17,943	15,731	24.87%	17,737	2,006	12.75%
UROC	8,031	7,289	24.10%	7,739	450	6.17%
Service Area Total:		59,739		68,349	8,610	**14.41%**

Projected linac need in this service area would rise from -2.51 to -0.87; but, pop/linac too low

Novant Revisions:
1.25 ESTVs for all energies (hospitals only); remains 1.0 for FSCs
1.50 for IMRT energies (hospitals only); remains 1.0 for FSCs (all energies)
0 for hospital imaging; bundled into energies
0 for weekly tx mgmt for FSCs (1,957 ESTVs @ MROC; 1,296 @ UROC)
2.0 for adult/pede under anesthesia
0.5 for FSC port film, **IGRT and 77014-TC**
3.5 for both SRS/SBRT

changes from current ESTV methodology bolded

SERO Model #1	2006-07 Procedures	2006-07 ESTVs	With Revisions to ESTV Values 2006-07 ESTVs	Change	Percent
CMC	17,957	17,521	22,903	5,382	30.72%
CMC-U	9,171	8,395	10,560	2,166	25.80%
MROC	12,049	10,803	12,849	2,046	18.94%
Presby	17,943	15,731	18,909	3,178	20.20%
UROC	8,031	7,289	9,119	1,830	25.10%
Service Area Total:		59,739	74,340	14,601	**24.44%**

Projected linac need in this service area would rise from -2.51 to +0.01; but, pop/linac too low

SERO 1 Revisions:
1.20 for all energies (both settings)
2.0 for IMRT energies (both settings)
0 for imaging codes (both settings)
0 for FSC weekly tx mgmt
2.0 for adult/pede under anesthesia
3.5 for SBRT in either setting
5.5 for SRS in either setting

Note: Using SBRT/SRS breakdown of 76% body:24% H&N

Five Scenarios for Revising ESTV Calculations

SERO Model #2	2006-07 Procedures	2006-07 ESTVs	With Revisions to ESTV Values 2006-07 ESTVs	Change	Percent
CMC	17,957	17,521	21,213	3,692	21.07%
CMC-U	9,171	8,395	9,670	1,276	15.19%
MROC	12,049	10,803	11,986	1,183	10.95%
Presby	17,943	15,731	17,229	1,498	9.52%
UROC	8,031	7,289	8,330	1,041	14.28%
Service Area Total:		59,739	68,428	8,690	**14.55%**

Projected linac need in this service area would rise from -2.51 to -0.86; but, pop/linac too low

SERO 2

Revisions: 1.20 for all energies (both settings)
1.5 for IMRT energies (both settings)
0 for imaging codes (both settings)
0 for weekly tx mgmt
2.0 for adult/pede under anesthesia
3.5 for SBRT in either setting
5.5 for SRS in either setting

Note: this revises the SERO #1 model by dropping IMRT ESTVs from 2.0 to 1.5; result is similar to Novant model

SERO Model #3	2006-07 Procedures	2006-07 ESTVs	With Revisions to ESTV Values 2006-07 ESTVs	Change	Percent
CMC	17,957	17,521	20,574	3,053	17.42%
CMC-U	9,171	8,395	9,380	986	11.74%
MROC	12,049	10,803	11,595	792	7.33%
Presby	17,943	15,731	16,722	991	6.30%
UROC	8,031	7,289	8,081	792	10.87%
Service Area Total:		59,739	66,352	6,614	**11.07%**

Projected linac need in this service area would rise from -2.51 to -1.17; but, pop/linac too low

SERO 3

Revisions: **1.15** for all energies (both settings)
1.5 for IMRT energies (both settings)
0 for imaging codes (both settings)
0 for weekly tx mgmt
2.0 for adult/pede under anesthesia
3.5 for SBRT in either setting
5.5 for SRS in either setting

Note: revises SERO #2 by dropping the regular XRT to 1.15, keeping IMRT multiple at 1.50.

With Revisions to ESTV Values

Five Scenarios for Revising ESTV Calculations

SERO Model #4	2006-07 Procedures	2006-07 ESTVs	2006-07 ESTVs	Change	Percent
CMC	17,957	17,521	19,934	2,413	13.77%
CMC-U	9,171	8,395	9,089	695	8.27%
MROC	12,049	10,803	11,203	400	3.70%
Presby	17,943	15,731	16,214	483	3.07%
UROC	8,031	7,289	7,833	544	7.46%
Service Area Total:		59,739	64,273	4,535	**7.59%**

Projected linac need in this service area would rise from -2.51 to -1.48; but, pop/linac too low

SERO 4

Revisions: **1.10** for all energies (both settings)
1.5 for IMRT energies (both settings)
0 for imaging codes (both settings)
0 for weekly tx mgmt
2.0 for adult/pede under anesthesia
3.5 for SBRT in either setting
5.5 for SRS in either setting

Note: revises SERO #3 by dropping the regular XRT to 1.10, keeping IMRT at 1.50.
Note: this results in the smallest ESTV increase among the various options.

new need

Application of Formula to Adjust Linac Need for SRS/SBRT Procedures

Examples of revising linac count for proportion of SRS/SBRT procedures performed:

Formula: **(0.33 + 0.67(1 - .2(#SRS/SRS capacity) - .8(#SBRT/SBRT capacity)) = linac value**

Using 200 SRS and 800 SBRT procedures as annual capacity

Example: (0.33 + 0.67(1 - .2(20/200) - .8(150/800) = fractional linac value
.33 + 0.67(1 - .02 - .15) = .886 low SRS/SBRT volumes

Example: (0.33 + 0.67(1 - .2(40/200) - .8(300/800) = fractional linac value
.33 + 0.67(1 - .04 - .30) = .772 mid-range SRS/SBRT volumes

Example: (0.33 + 0.67(1 - .2(100/200) - .8(500/800) = fractional linac value
.33 + 0.67(1 - .10 - .50) = .598 high SRS/SBRT volumes

Assumptions:

1) a dedicated SRS/SRT treatment center, i.e. CyberKnife, could be said to be at capacity with 200 SRS and 800 SRT procedures/year (1,000 total)
2) SRT procedures are defined as all stereotactic cranial or body procedures with 2-5 total treatments

Back testing this formula achieves the following revised need:

Currently, the CyberKnife unit at **Mission** is reported as 1.0 linac. We have determined that over the past 12 months the unit performed 138 procedures. 65, or 47%, were SRS, & 73, or 53%, were SBRT. Applying the formula above would yield:

(0.33 + 0.67(1- .2(65/200) - .8(73/800)) =

(0.33 + 0.67(1- .065- .073) =

(0.33 + 0.67(.862)) = **0.9075** linac

Population/linac in svc area 2 is too low for new need. Revised need with this formula would rise from -1.86 to -1.77.

Currently, the Novallis unit at **CMC** is reported as 1.0 linac. We have determined that over the past 12 months the unit performed 511 procedures. 119, or 23%, were SRS, & 392, or 77%, were SBRT. Applying the formula above would yield:

(0.33 + 0.67(1- .2(119/200) - .8(392/800)) =

(0.33 + 0.67(1- .119- .392) =

(0.33 + 0.67(.489)) = **0.65763** linac

Population/linac in svc area 7 is too low for new need. Revised need with this formula would rise from -2.51 to -2.17.

Application of Formula to Adjust Linac Need for SRS/SBRT Procedures

Currently, the CK unit at **CMC-NE** is reported as 1.0 linac. We have checked, and over the past 12 months they performed 183 procedures. 21, or 11.5% were SRS, and, 162, or 88.5%, were SBRT. Applying the formula above would yield:

(0.33 + 0.67(1- .2(21/200) - .8(162/800)) =

(0.33 + 0.67(1- .021- .162) =

(0.33 + 0.67(.817)) = **0.87739** linac

Population/linac in svc area 9 svc area is too low for new need. Revised need with this formula would rise from -0.42 to -0.29.

Currently, the GammaKnife at **WFU** is reported as 1.0 linac. In 2006-07 they reported 322 GK procedures (head and neck) and a separate 11 SRS linac procedures, presumably SRT, for a combined total of 333 procedures, 97% SRS and 3% SRT, all on one linac:

(0.33 + 0.67(1- .2(322/200) - .8(11/800)) =

(0.33 + 0.67(1- .322 - 0.011) =

(0.33 + 0.67(.667)) = **0.7769** linac

Population/linac in svc area 10 is too low for new need. Revised linac need with this formula would rise from -1.21 to -0.98.

We have checked with **DUMC**, which reports SRS/SBRT activity for 2.0 separate linacs. Both these linacs are presently counted as 1.0 units. Over a recent 12 month period, these two linacs performed a combined 265 procedures. 137, or 52% were SRS, and, 128, or 48%, were SBRT. Applying the formula above would yield:

(0.33 + 0.67(**2**- .2(137/**400**) - .8(128/**1,600**)) =

(0.33 + 0.67(**2**- .0685- .064) =

(0.33 + 0.67(1.8675)) = **1.5812** linac

Population/linac in svc area 16 is low, but patient inflow is high. Revised need with this formula would rise from 0.05 to 0.47, resulting in need for an additional linac.

However: DUMC notes that it will now perform all SRS/SBRT only on its Novalis unit.

Currently, **ECU** has both GammaKnife and CyberKnife units, counted as 2.0 linacs. For 2006-07 they reported 119 on the former and 48 on the latter, for 167 combined units. I will assume that the GK units are all SRS and that the CK units are 75% SRT and 25% SRS:

(0.33 + 0.67(**2**- .2(131/**400**) - .8(36/800)) =

(0.33 + 0.67(**2**- .0655 - 0.036) =

(0.33 + 0.67(1.8985)) = **1.6020** linac

Population/linac in svc area 26 is too low for new need. Revised linac need with this formula would rise from -0.94 to -0.54

Note: unable to adjust for Carolina Radiation Medicine SRS/SBRT procedures
Note: using 2006-07 hospital licensure or other more recent treatment data