Outpatient Health Care Resources Utilized by Infants in High-Risk Infant Follow-up Programs in California: Initial Results of a Quality Improvement and Research Network.

Missed Opportunities in High-Risk Infant Follow-Up: Referrals to Early Intervention.

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Objective

Describe and compare the utilization of health care resources among different birthweight groups of high-risk infants between NICU discharge and HRIF Visit #1.

Distribution by Birthweight

	n (%)
ELBW (<1000g)	1114 (22)
VLBW (1000-1499g)	1670 (33)
LBW (1500-2499g)	1230 (24)
NBW (≥ 2500g)	1115 (22)
Totals	5129

Neonatal-Medical Characteristics by Birthweight

	ELBW (N=1114)	VLBW (N=1670)	LBW (N=1230)	NBW (N=1115)	Totals
Seizures	3% (28)	<1% (7)	3% (23)	17% (192)**	5% (250)
Oxygen >28 days + CLD	22% (250)**	13% (215)	8% (101)	8% (93)	13% (659)
Persistently Unstable^^	13% (142)	11% (188)	13% (154)	17% (187)*	13% (671)
Intracranial Hemorrhage	17% (194)**	6% (99)	6% (69)	5% (52)	8% (414)
Develop. CNS Abnormality	1% (12)	<1% (7)	3% (31)	8% (91)**	3% (141)
HIE	<1% (1)	<1% (4)	1% (9)	10% (110)**	2% (124)

** $p \leq .001$
* $p < .05$

^^ Prolonged hypoxia, acidemia, hypoglycemia, or hypotension
HIE = Hypoxic Ischemic Encephalopathy
CLD = Chronic Lung Disease

Health Care Resources by Birthweight

	ELBW (N=1114)	VLBW (N=1670)	LBW (N=1230)	NBW (N=1115)	Totals
Utilizing Early Intervention Program	31% (347)**	14% (234)	12% (144)	21% (234)	19% (959)
Utilizing Outpatient Support Services†	37% (408)**	24% (400)	17% (208)	28% (307)	46% (1323)
Utilizing Outpatient Medical Subspecialty	70% (744)**	50% (833)	41% (503)	54% (601)	53% (2711)

** $p \leq .001$

Outpatient Medical Subspecialties by Birthweight

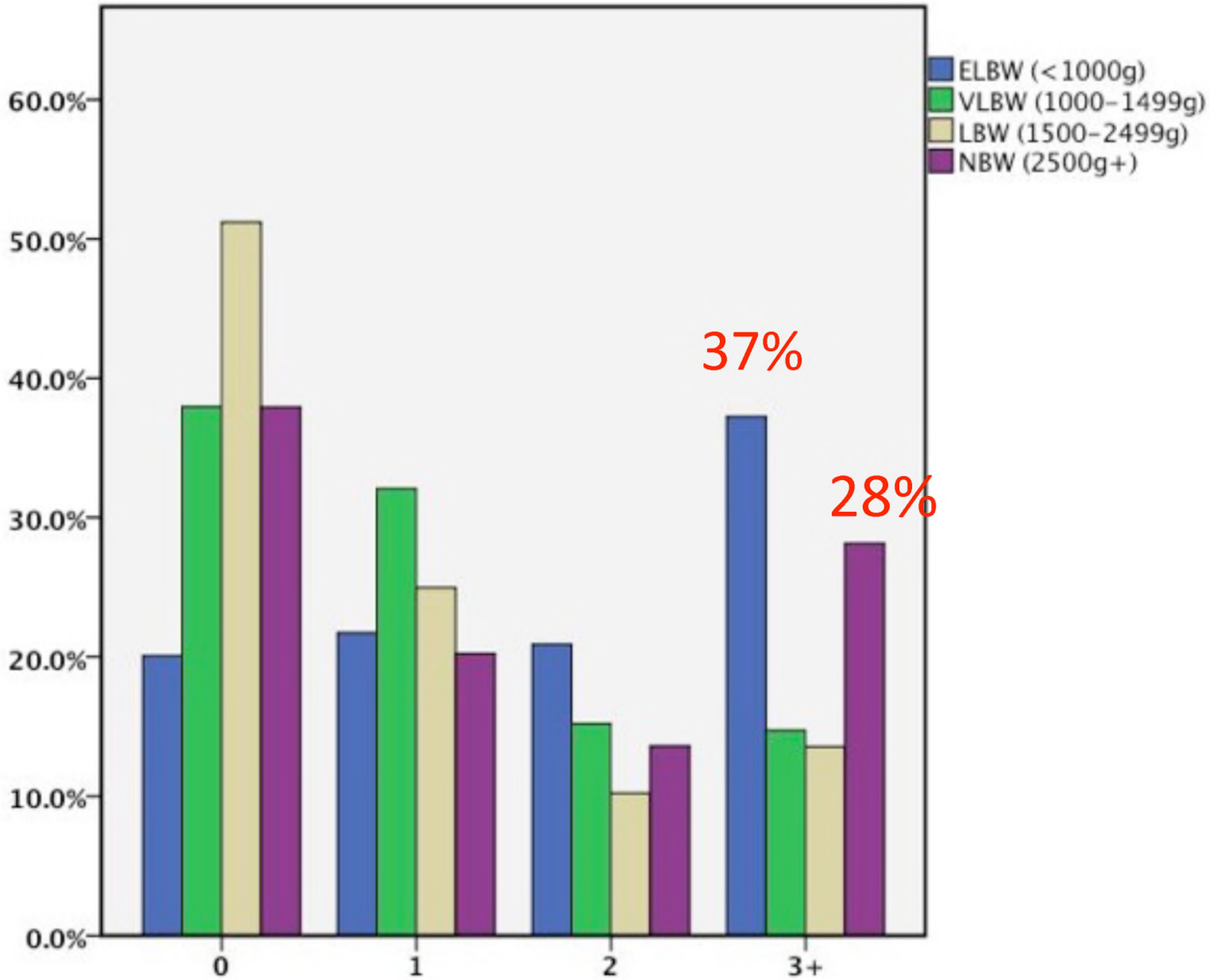
	ELBW (N=1114)	VLBW (N=1670)	LBW (N=1230)	NBW (N=1115)	Totals
Cardiology	8% (90)	6% (100)	10% (120)	16% (174)**	9% (484)
Neurology	5% (60)	3% (46)	6% (70)	24% (269)**	9% (445)
Ophthalmology	54% (606)**	38% (626)	23% (278)	11% (127)	32% (1637)
Pulmonology	22% (247)**	5% (91)	4% (45)	6% (62)	9% (445)

** $p \leq .001$

Outpatient Support Services by Birthweight

	ELBW (N=1114)	VLBW (N=1670)	LBW (N=1230)	NBW (N=1115)	Totals
OT	7% (75)	4% (60)	4% (53)	8% (90)	5% (278)
PT	14% (158)	8% (129)	7% (91)	14% (156)	10% (534)
Nursing	11% (121)	9% (156)	5% (66)	6% (71)	8% (414)

Utilization of Health Care Resources by Birthweight



Number of Health Care Resources

(outpatient medical + support services)

Conclusions

- A high proportion of high-risk infants are utilizing health care resources within the first year after NICU discharge by the time they are seen at HRIF visit #1.
- The distribution of services utilized within the first year after NICU discharge is reflective of the medical problems expected in this patient population.
- High service utilization in this population has a bimodal pattern with respect to birthweight.
- A high proportion of NBW high-risk infants utilized several health care resources.

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Objectives

Assess statewide rates of referrals to EI for high-risk infants who demonstrate significant developmental delay following NICU discharge.

Inclusion Criteria

- Standardized developmental assessment during HRIF Visit #1 (4-8 months of age, adjusted for prematurity)

AND/OR

- Standardized developmental assessment during HRIF Visit #2 (12-16 months of age, adjusted for prematurity).
- Scores represented as a developmental quotient (DQ) with a mean of 100, standard deviation of 15.

HRIF Visit #1


5129
3270
Developmental Assessment
1859
No Developmental Assessment
2682
DQ>70
588
DQ≤70

Socio-demographic Characteristics

	DQ >70 (N=2680)	DQ ≤70 (N=588)	Totals
Male Gender	56% (1500)	58% (339)	56% (1839)
Maternal Non-White Minority Status	37% (697)	38% (169)	37% (866)
Non-English Speaking Caregiver	26% (641)	38% (202)**	28% (843)
Caregiver Education < High School Degree	20% (353)	29% (103)**	22% (456)
Government Health Insurance	48% (1278)	58% (342)**	50% (1620)

** $p \leq .001$

** $p \leq .001$

Neonatal Characteristics

	DQ >70 (N=2682)	DQ ≤70 (N=588)	Totals
Oxygen >28 days and CLD	10% (269)	18% (105)**	11% (374)
Persistently Unstable†	13% (352)	18% (108)**	15% (460)
Seizures	4% (95)	11% (63)**	5% (158)
Intracranial Hemorrhage	7% (185)	12% (73)**	8% (258)
Other Neurologic Abnormality^	22% (585)	30% (177)**	23% (762)

** $p \leq .001$

† Prolonged hypoxia, acidemia, hypoglycemia, or hypotension

^ e.g. CNS malformation, CNS infection, periventricular leukomalacia, hypoxic ischemic encephalopathy

Birthweight Characteristics

Birthweight	DQ >70 (N=2687)	DQ ≤70 (N=589)	Totals
ELBW (<1000 g)	20% (539)	27% (160)	22% (699)
VLBW (1000-1499 g)	34% (904)	22% (131)	32% (1035)
LBW (1500-2499 g)	26% (691)	18% (104)	24% (795)
NBW (≥2500 g)	20% (548)	33% (193)	23% (741)

ELBW = extremely low birth-weight; VLBW = very low birth-weight
LBW = low birth-weight; NBW = normal birth-weight

EI Status of Children with DQ ≤70 at HRIF Visit #1

	N=588
	N (%)
EI before HRIF Visit #1	187 (32)
No EI before HRIF Visit #1	401 (68)
EI Referral Made	109 (27)
No EI Referral Made	292 (73)

HRIF Visit #2


1737
1169
Developmental Assessment
568
No Developmental Assessment
978
DQ >70
191
DQ ≤70

EI Status of Children with DQ ≤70 at HRIF Visit #2

	N=191
	N (%)
EI before the HRIF Visit #2	108 (57)
No EI before HRIF Visit #2	83 (43)
EI Referral Made	18 (22)
No EI Referral Made	65 (78)

Conclusions

- A high proportion of infants identified as high-risk in the NICU are not being referred to EI even after having a documented developmental delay.
- Reasons for why these infants were not referred are unclear.
- These findings suggest a quality improvement issue and underutilization of EI for young children with developmental delays.
- Several socio-demographic and neonatal factors characterize children who have significant developmental delay.

Conclusions

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Reasons for why these infants were not referred are unclear.

- Data entry issues.
- HRIF providers are taking too long of a "wait-and-see" approach.
- Parents or primary pediatric providers are referring children themselves.
- Inadequate resources some HRIF programs have to provide care-coordination for infants and their families.
- Parents are rejecting the offer for EI referral.
- Infants still had active medical issues.

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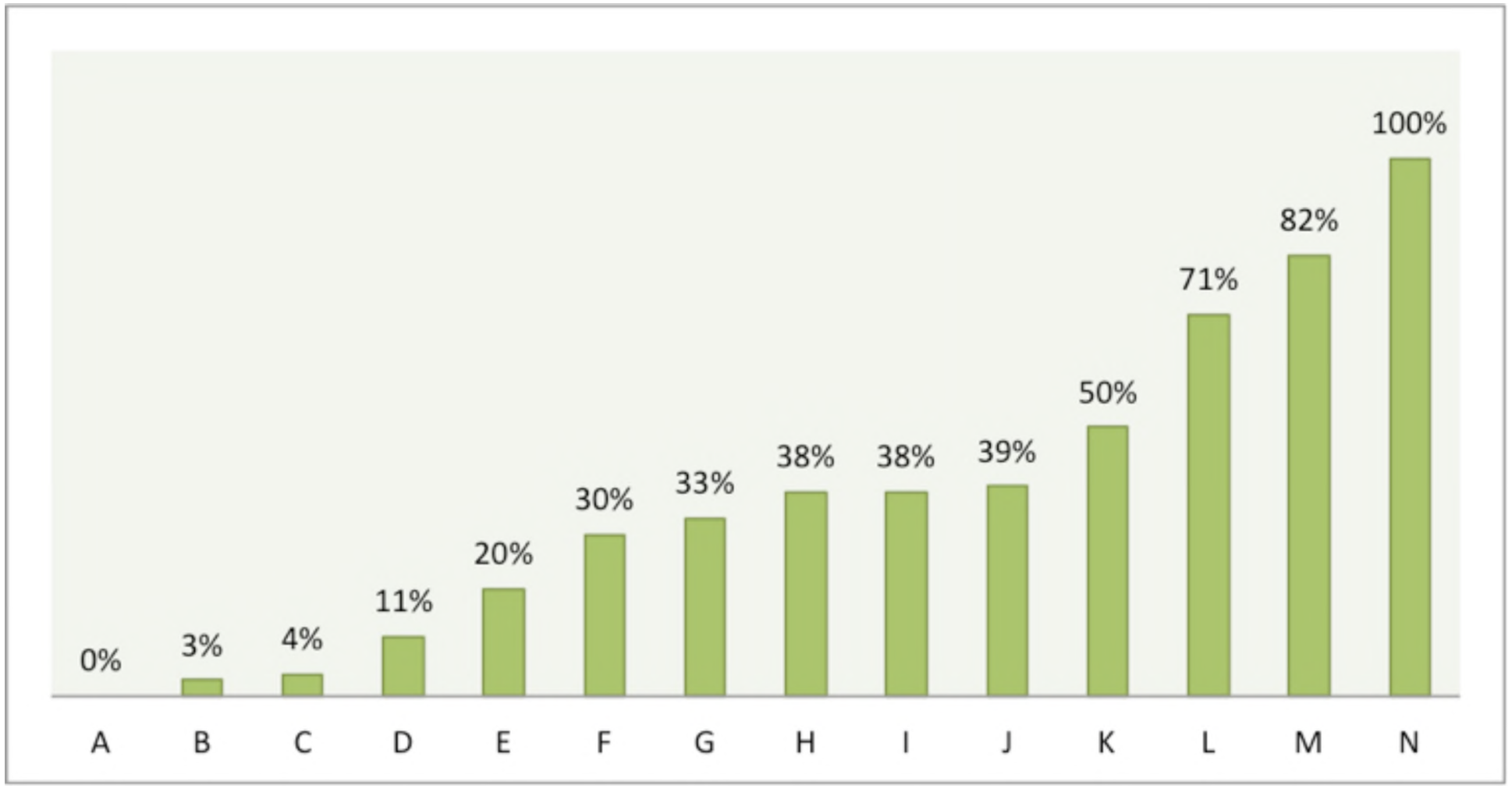
Percentage of Infants Referred to EI with DQ≤70 and No Prior EI



Regional HRIF Program

EI Status of Children with DQ ≤70 at HRIF Visit #1

	N=588
	N (%)
EI before HRIF visit #1	187 (32)
No EI before HRIF visit #1	401 (68)
EI Referral Made	109 (27)
No EI Referral Made	292 (73)

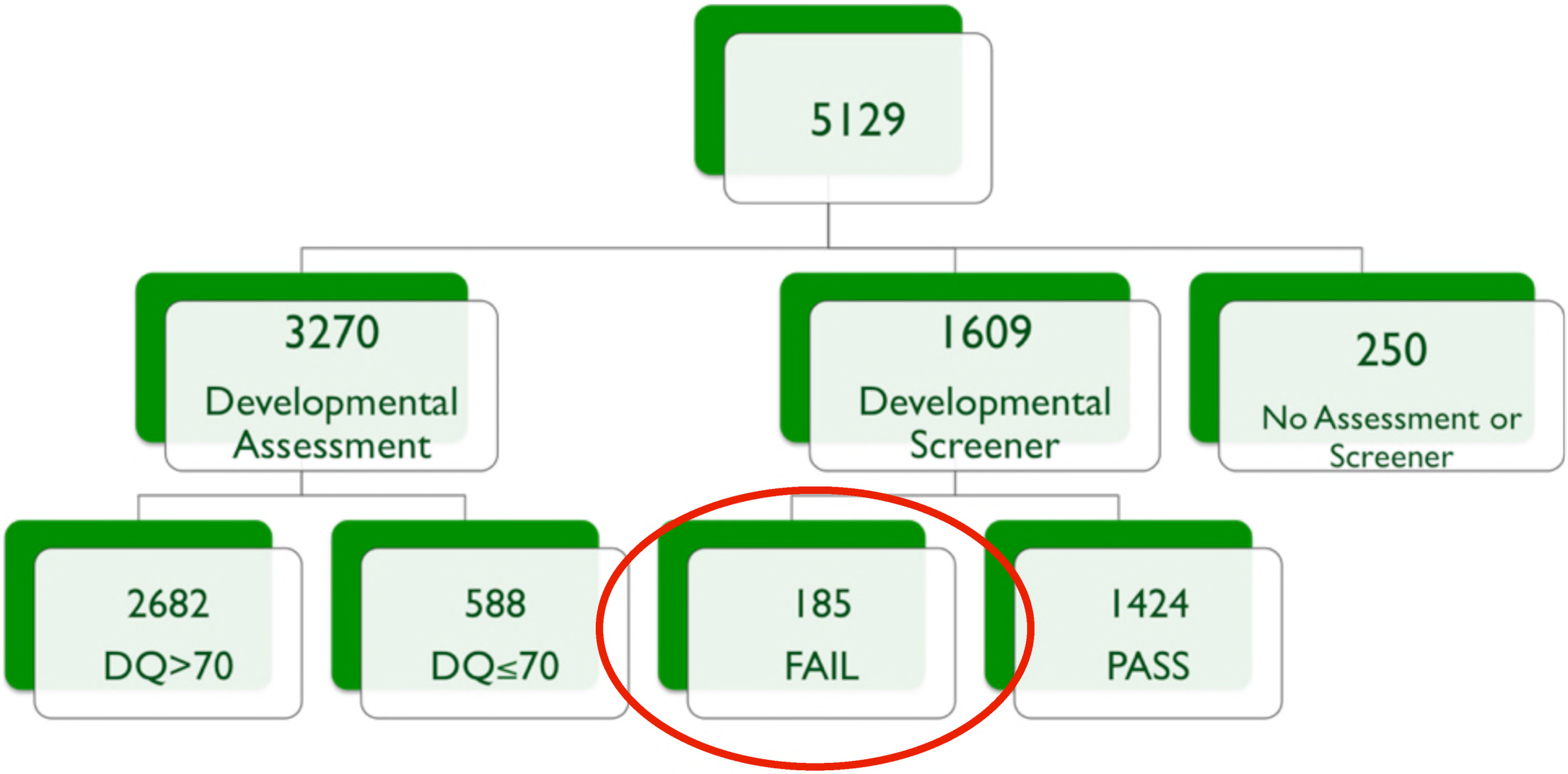
Referrals to Special Services at HRIF Visit #1†

	No EI Referral (N=292)	EI Referral (N=109)	Totals
No referral to other services*	47% (136)	28% (31)	42% (167)
Referral to other services*	53% (156)	72% (78)	58% (234)

†Infants with DQ ≤70 and no prior EI

* e.g. Physical therapy, occupational therapy, social work

HRIF Visit #1


5129
3270
Developmental Assessment
1609
Developmental Screener
250
No Assessment or Screener
2682
DQ>70
588
DQ≤70
185
FAIL
1424
PASS

EI Status of Children with Failed Developmental Screener at HRIF Visit #1

	N=185
	N (%)
EI before HRIF visit #1	67 (36)
No EI before HRIF visit #1	118 (64)
EI Referral Made	37 (31)
No EI Referral Made	82 (69)